

## June Sales May Hit 230,000

### Ford Cuts \$10 to \$20

DETROIT, June 15—Price reductions ranging from \$10 to \$15 on all passenger car models and from \$10 to \$20 on trucks and commercial cars have been announced by the Ford Motor Co., effective today. The cuts apply to all V-8 models. All Tudor body types are down \$15.

### May Car Registrations Estimated at 238,000

PHILADELPHIA—Based on returns from sixteen states, *Automotive Industries* estimates that new passenger car registrations in May totaled 238,000 against 160,242 a year ago and 222,900 in April, 1934. This estimate shows an increase of 49 per cent over last year and of 7 per cent over April.

These partial returns indicate that Ford and Chevrolet are running neck and neck for leadership with Ford in front on the basis of the states which have already reported.

R. L. Polk & Co. on the basis of reports from eleven states estimates May truck registrations at 38,000 which is slightly under the April, 1934, figure of 38,882, but is a substantial increase over the 20,925 registered a year ago.

### Plymouth Adds New Special Six Series

DETROIT—A new special six series differing only in equipment and finish from the 108-in. independent suspension model has been announced by Plymouth. Prices on the new line are \$20 higher on all models for which the customer gets steel wheels similar to those used on the deluxe series, dual tail lamps, chrome-plated windshield frame and headlamps, Valchrome satin finish radiator grille, interior sun visor, built-in radio antennae, and a new instrument panel with glove compartment and ash receiver.

## Standard Model Price Cuts Efficacious Sales Booster

by Athel F. Denham

Detroit Editor, *Automotive Industries*



D. G. "Barney" Roos, Studebaker chief engineer and president of the S.A.E. which opens its annual Summer Meeting at Saranac, N. Y., on June 18

### A. E. Barit and S. G. Baits Promoted by Hudson Co.

DETROIT—Announcement has been made by Roy D. Chapin, president, of the appointment of A. Edward Barit to the position of general manager and of Stuart G. Baits as assistant general manager of the Hudson Motor Car Co. Mr. Barit, who has been with the Hudson Company for 25 years, retains his former duties as vice-president and treasurer. Mr. Baits will continue to act as chief engineer for Hudson. He had been with the company for 19 years.

While no mention thereof is made in the announcement, it is unofficially reported that under the new set-up Messrs. Barit and Baits will supervise production, engineering and purchasing, leaving Mr. Chapin free to devote more of his time to the supervision of sales, service and merchandising activities.

DETROIT—Retail domestic deliveries of passenger cars to June 10, judging from incomplete reports, indicate that sales are currently running at the same levels as early May. If this rate is maintained it is not inconceivable that June totals will run close to May. Truck deliveries, while showing a decline ranging from 10 to 15 per cent as compared with the same period in May, are still farther ahead of 1933 comparable figures than are passenger cars.

Indications at present are that June total domestic deliveries may aggregate between 225,000 and 230,000 including trucks, this representing a normal percentage of decline from May figures.

Throwing some uncertainty into the figures is the matter of price reductions, many of which have been made so recently that their effect cannot be properly gauged as yet. Nevertheless, it has already become apparent that price reductions on standard models are proving more efficacious in obtaining sales than the introduction of lower priced models with less expensive trims and fewer trimmings.

So far, of course, price reductions have been confined mainly to the under \$1000 classes and these groups are mainly responsible for the good sales showing of the past week or so. It is not likely, however, that widespread price reductions will take place in the middle and upper price classes at present.

Individual company reports released for publication include domestic sales totaling 6,953 by Plymouth in the week ending June 9, representing a 10 per cent increase over same period last year. Shipments increased over the previous week to a total of 7,405.

Dodge reports sales of 2,034 Dodge cars and 849 trucks during the week ending June 9.

Cadillac reports complete domestic deliveries for May as more than double

May last year and slightly above April this year. Cadillac as well as Buick showed marked increase in deliveries latter part of month, the latter registering 2,079 sales last ten days. While the "40" is responsible for most of the increase the factory states that higher priced lines are holding up well. Buick retail deliveries to June 1 aggregate 23,347, of which 5213 were delivered in May.

General Motors' Canadian production in the first 5 months of 1934 has already surpassed the total production of the previous year by a margin of about 5,000 cars. Present plans call for a June production schedule of about 7,000 units for domestic and export delivery.

Chevrolet retail sales the first five months of this year total 364,872 as compared with 253,263 for the same period a year ago, an increase of over 110,000 units. Domestic truck deliveries for the five months nearly doubled last year's figure, 68,207 units being delivered against 34,372 units in 1933.

Production and shipments of Airflow De Soto cars reached a new high for the year during May with a total of 3,141 units, an increase of 77 per cent over May of last year. De Soto has shipped a total of 9,276 Airflow cars during the first five months of the year, an increase of 17 per cent over the 7,905 units shipped in the corresponding period of 1933.

Nash reports the largest May shipments since 1929—an increase of 445.65 per cent over May a year ago.

### Wisconsin Motor To Build Diesel Engines

MILWAUKEE—Wisconsin Motor Co. of Milwaukee, one of the pioneer manufacturers of gasoline engines for the automotive industries, has announced that it will commence production of Diesel engines for all railroad, industrial and marine purposes within the next 60 days. Manufacture of gasoline engines will be continued as before.

M. J. Murphy, formerly chief engineer of the Caterpillar Tractor Co., who has had 14 years' experience in Diesel engine development, will be in charge of the new Wisconsin-Diesel division. He has been developing the line for several months. It will range from one to six cylinders and a power range of 8 to 150 hp.

### Rim Inspection Report

DETROIT—The Tire and Rim Association, Inc., reports a total of 1,140,132 rims inspected for May. This is an increase of 202,049 over the same month of 1933. The report covering the first 5 months of this year shows a total of 6,478,987 rims against 3,490,253 for the corresponding period of last year.

### White Co. Ordered To Pay 27-Year Old Claim

MONTREAL—After 27 years of litigation Justice Philippe Demers sitting in Superior Court has ordered cancelled a sale of an old type steam driven automobile by the White Co. of Cleveland, to the Dominion Motor Car Co. Ltd. of Montreal. The plaintiffs charged that the car failed to function properly when delivered in 1907 and driven to Thetford Mines, P. Q., resulting in the purchaser's refusal to accept the car.

Originally the dealer sued for \$10,000 which included purchase price, repair costs and damages arising from loss of business in consequence of discredit cast upon this particular type of automobile. A judgment was allowed in 1910 when the defendant company failed to appear in response to summons. It was not until 1931 that the judgment was served upon the White Co. which then entered a defense on the grounds that the management then in control knew nothing of the earlier transaction and consequently were not liable for the judgment. Justice Demers has now ordered the White Co. to pay \$3,319, with interest, since the taking of the action.

### Ford, Barred From Gov't Bids, May Display Eagle

WASHINGTON—Though a new NRA ruling will permit the Ford Motor Co., and all other companies which have not signed NRA codes to display the Blue Eagle, yet Ford may not enter bids for government contracts despite compliance with all code provisions.

Officials point out that a clear cut assent and pledge to continuous compliance with code provisions is mandatory if the company desires to compete for government business. On the other hand the Ford Co. has stated repeatedly that it considers NRA the law and is complying with all provisions of the automobile code.

### Bus Code Authority Fixes Fare Schedule

WASHINGTON—The Motor Bus Code Authority has fixed and announced the minimum rates, fares and charges which motor bus operators must make in six principal areas of the country. Rates and fares have been fixed for the sections of Chicago, Detroit, Cleveland, Toledo, New York and Philadelphia. A special schedule of reduced rates to the Century of Progress Exposition from the above named territories have been fixed by the Code Authority.

## Senate Leaders Delay Strike Stopgap Bill

Republican Conference Appoints Subcommittee To Consider Amendments

WASHINGTON, June 14—While the Amalgamated Association of Iron, Steel and Tin Workers apparently stalls for time in their Pittsburgh convention called to consider the threatened steel strike, legislative action looking toward averting or settling the situation has been held up until at least tomorrow, if not longer.

The plan provided by Democratic leaders in the Senate following a conference with President Roosevelt to set up mediation boards through a joint resolution was considered this morning at a Republican conference which criticized the proposal and named a subcommittee to consider amendments to the resolution. They will be reported tomorrow morning. The subcommittee of Republicans is headed by Senator James J. Davis of Pennsylvania, former steel worker. Other members are Senators Couzens, Goldsboro, Steiwer and Walcott.

Reports were in circulation that the President may later in the day send a brief message to Congress urging quick action of the strike legislation but that, despite pressure from steel workers, he will intervene no further.

The Republicans proposed a wide range of amendments to the resolution, which is offered as a substitute for the Wagner Labor Disputes measure. Although the nature of the suggested amendments has not been revealed, it is known, however, that no legislation is proposed which would grant outright recognition to the union. Such recognition has been demanded by steel workers.

General Johnson said that NRA is taking no part in the Pittsburgh convention and has no relation to the threatened strike. Jurisdiction over strikes, he declared, rests by executive order with the National Labor Board. The only government representative at the Pittsburgh Convention is James F. Dewey, connected with the Labor Department. He was sent to Pittsburgh to represent Secretary of Labor Frances Perkins to offer services of the Labor Department in case they are desired.

### Herman Schwarze

DETROIT—Herman Schwarze, who helped Charles F. Kettering with the development of the original self-starter on the Cadillac, died of a heart attack on June 1. At the time of his death he was associated with Ben Anibal, vice-president in charge of the Pontiac Motor Co. When R. H. Collins left Cadillac, Mr. Schwarze followed him to Peerless.

## Dealers' Opposition to Local Shows Grows

**Late Date, Simultaneous Showings Form Principal Objections to N.A.C.C. Plan**

DETROIT—Considerable opposition is reported in dealer circles to the plan for dropping the National Shows for local exhibitions held during a single week late in February, as proposed by the N.A.C.C. Moreover, there is now some feeling that the labor outlook is much better than it was when the plan was originally revealed. This latter factor is of considerable importance since the fear of labor troubles such as those which held up production this year was probably the most important reason the manufacturers considered the abandonment of the National Shows.

There is some feeling now, however, that labor relations in the tool and die field are likely to be stable for the balance of the year and, moreover, considerable work has gone out of the Detroit area. Consequently in some quarters the threat of tool and die strike which would upset national show plans, is not regarded as so serious as it was a short time ago. In fact some executives feel that the labor situation has been pretty well cleared up for the balance of the year and that if further trouble is encountered, it will not come until next spring.

Dealer objections to dropping the National Shows center around the effects on the interest in the local shows, concentration of the shows in a single week, and the late date proposed for the simultaneous showings.

## Chicago Dealers Favor Nat'l Show

CHICAGO—The plan now before the National Automobile Chamber of Commerce to discontinue the national automobile shows heretofore held annually at New York and Chicago and to hold in their stead dealer shows simultaneously throughout the country, is meeting strong opposition in Chicago dealer circles.

Voicing the views of leading dealers opposing this plan, George H. Bird, vice-president of the Bird-Sykes Company, Graham distributors, and secretary of the Chicago Automobile Trade Association, states:

"For thirty-four years the two national automobile shows in Chicago and New York have been time-honored institutions. They have been more than that, because they have produced benefits to the automobile industry at large that could have been secured in no other way, and have thereby justified themselves and proved their right to survive."



### Heads Handicap Golfers

Byron C. Foy, DeSoto president and Chrysler vice-president, who has been elected president of the Handicap Golfers' Association of America, an organization dedicated to the great army of average players

## Miss Perkins' Aid Asked at Auto-Lite

TOLEDO—Conditions are tranquil at the Electric Auto-Lite Co. plant here following a series of outbursts on the part of the union leaders in the first few days when many mix-ups occurred as strikers were taken back on the payroll.

A rather serious break threatened when Thomas J. Ramsey, business agent of the automotive workers' union, openly charged the Auto-Lite with breaking the agreement and wired Secretary of Labor Frances Perkins to intercede. Through efforts of E. H. Dunnigan, representative of the Department of Labor, charges were threshed out over the week end and much more harmonious relations were in effect this week.

Many of the strikers, in the minority, when returning charged other workers with squirting oil in lunches, greasing machine handles and seats, assaults in various places in the plant. Company supervisors were given detailed instructions to prevent hostilities.

Two shifts of workers are now employed so that many of the strikers could get back their original jobs.

Nearly 200 agitators gathered at the Auto-Lite plant Monday expecting a renewal of warfare, but were told by police to "move on." Nothing happened.

## Sales Increase Noted In General Motors Showings

DETROIT—Reports on General Motors showings, while still incomplete, indicate an increase of roughly 35 per cent in sales over the showings in April, 1932, in spite of a drop in attendance.

## Wagner Substitute Less Objectionable

DETROIT—Although leading automotive executives feel that no more labor legislation should be passed until more experience is had with agencies similar to the Automobile Labor Board, if it is necessary to ward off a steel strike, they regard the resolution offered to Congress on Wednesday of this week by the administration as more acceptable than the Wagner Bill.

The resolution authorizes the President to create boards which would be empowered and directed to investigate issues, facts, practices or activities of employers and employees in any controversy arising under N.I.R.A. The board would be authorized to conduct elections to settle representation disputes and to order production of necessary records. The orders of the boards would be enforceable through the federal courts in the same manner as the mandates of the Federal Trade Commission. Violation of orders of the boards or interference with their functioning would be subject to maximum penalties of \$1000 fine and/or one year in jail.

Apparently the boards appointed under this resolution would be very much like the Automobile Labor Boards although in addition they would have the backing of specific legislation. In the hands of the President, many feel that the resolution might work out rather well.

Some objection is being made to the portion of the resolution authorizing the boards with the President's approval to prescribe rules and regulations. This power, some believe, might be used to prescribe the closed shop.

## McCord Co. To Relieve Harris of Extra Duties

DETROIT—J. D. Harris, executive engineer of the McCord Radiator and Mfg. Co., who some two years ago took over the duties of chief engineer in addition to his own, will confine his duties to that of executive engineer as soon as a successor as chief engineer can be secured.

## April Retail Financing Totaled \$87,923,187

WASHINGTON—Retail automobile financing totaled \$87,923,187 in April covering 231,579 vehicles. These figures compare respectively with \$69,202,632 and 183,724 in March, 1934, and with \$45,337,026 and 132,088 in April, 1933, according to the Census Bureau.

Wholesale financing increased from \$102,775,967 in March to \$120,992,736 in April. The April total is nearly three times that of April, 1933.



## Dun Survey Shows 58% of Car Dealers and 65% of Garages Made Money in '33

NEW YORK—If 1538 car dealers and 1119 garages surveyed by Dun & Bradstreet, Inc., may be regarded as typical of the trade as a whole, then 58 per cent of all automobile dealers and 64 per cent of all garages made a net profit on their operations in 1933. Considering the conditions which prevailed last year, perhaps automotive retailing isn't such a lousy business as some of the criticisms directed at it would indicate.

The 1538 car dealers surveyed had 1933 net sales of \$205,081,300 and reported net profit of \$5,384,000, or 2.63 per cent on the volume. Of the group, 888 were in the black, while 650 had red figures to show for their efforts. The profit-makers had net sales of \$140,573,600 on which they reported net profits of 7.85 per cent, equivalent to \$11,035,000. Those reporting losses had net sales of \$64,507,700 on which they lost \$5,651,000, or 8.76 per cent.

Table I below shows how the two groups stacked up on various accounting items, the marked differences in mark-ups and overhead expenses being particularly worthy of note.

The survey also gives break-downs of the reports received from dealers by annual volume groups and by Federal Reserve Districts. Among dealers who made money in 1933, the ratio of net to sales goes generally upward as sales volume went down. In other words, the smaller dealers salvaged relatively higher percentages of their sales in

the form of net profits than did the larger ones. For dealers reporting 1933 losses, the percentage of loss on sales was largest for the smallest dealers, the ratio declining to a minimum for the \$250,000 to \$500,000 group and then starting upward again as volume increased. However, the number of dealers in some of the volume groups is so small that the figures cannot be accepted as typical.

The analysis on the basis of Federal Reserve Districts shows, for dealers reporting profits, that those in the Richmond, Atlanta and Dallas zones earned better than 9 per cent on sales, which is not surprising in view of the relatively large increases in sales volume in these areas last year. The lowest percentage of profit (5.82 per cent) is shown for the Boston District. For dealers reporting losses, those in the Cleveland District reported the highest average percentage of loss on sales (12.54 per cent) and the New York District the lowest (4.91 per cent).

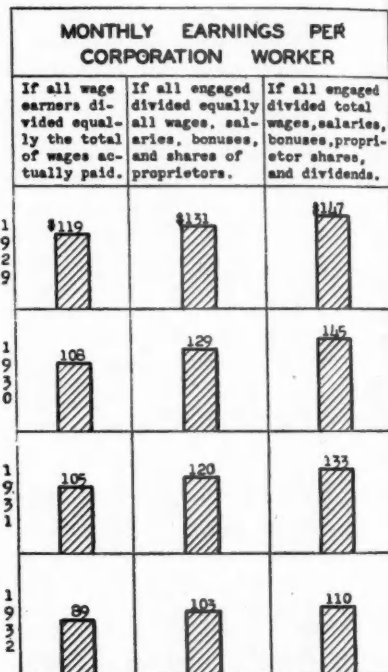
The 1119 units which reported in the garage survey had net sales of \$29,585,600 last year, on which they earned 2.2 per cent or \$650,000. In the group there were 717, or 64.09 per cent, who were in the black. They had net sales of \$19,208,800, on which their net profits were \$2,350,000, or 12.23 per cent. The losers, on the other hand, sold \$10,376,800 and lost \$1,700,000, or 16.38 per cent. Table II gives the detail figures.

The garage survey also has break-downs by volume classes and by Federal Reserve Districts. The volume break-down shows that both profit and loss ratios go up as volume goes down. On the basis of Reserve Districts, for garages reporting 1933 profits, those in the Cleveland District show the

highest percentage on sales (17.24 per cent) and those in the Boston District the lowest (9.40 per cent). Among garages reporting 1933 losses, those in the Boston District had the highest percentage of loss, while those in the Richmond District had the lowest (26.61 per cent and 5.90 per cent respectively).

## GM Registers 348,230 Stockholders of Record

NEW YORK—The total number of General Motors common and preferred stockholders for the second quarter of 1934 was 348,230 compared with 351,949 for the first quarter of 1934 and with 366,084 the second quarter of 1933. There were 329,495 holders of common stock and the balance of 18,735 represents holders of preferred stock.



From the Bulletin of the Cleveland Trust Co.

Table I

	Averages for 888 Dealers Reporting Net PROFIT in 1933	Average of 650 Dealers Reporting Net LOSS in 1933
(Note—Percentages are figures on net sales)		
Per cent of total volume of group.....	68.55%	31.45%
Operating Factors		
Net profit or loss.....	7.85	8.76
Total overhead expense.....	17.53	26.13
Cost of goods sold.....	74.67	81.84
Mark-up.....	32.12	23.41
Inventory turnover.....	15.45 Times	11.54 Times
Overhead Factors		
Salaries of owners and officers.....	3.06%	4.41%
Employees' salaries and wages.....	5.45	7.13
Rent.....	1.59	2.27
Advertising.....	.69	.71
Light, heat and gas.....	.67	.93
Taxes.....	.54	.76
Other expense.....	4.49	5.98

Table II

	Average for 717 Garages Reporting Net PROFIT in 1933	Averages for 402 Garages Reporting Net LOSSES in 1933
(Note—Percentages are figured on net sales)		
Percentage of total volume of group.....	64.92%	35.08%
Operating factors		
Net profit or loss.....	12.23	16.38
Total overhead expense.....	22.98	39.88
Cost of goods sold.....	64.74	71.24
Mark-up.....	58.66	39.36
Inventory turnover.....	13.04 Times	9.87 Times
Overhead factors		
Salaries of owners and officers.....	6.29	9.15
Employees' salaries and wages.....	5.89	8.82
Rent.....	2.84	4.73
Advertising.....	0.66	0.94
Light, heat and gas.....	1.71	2.10
Taxes.....	0.90	1.38
Other expense.....	3.65	6.25

## Buick Personnel Changes

FLINT—The following changes in personnel have been announced at the Buick plant: O. W. Young, formerly superintendent of factory No. 12, becomes general superintendent in charge of all productive operations. A. T. Brabyn, formerly assistant general master mechanic, becomes master mechanic, replacing W. H. Eddy, resigned. F. C. Pyper, formerly general tool supervisor, becomes assistant general master mechanic. Harry Heron, formerly assistant superintendent and before that for seven years process engineer of the sheet metal division, becomes superintendent of factory No. 12. A. R. Middleton, formerly division head at factory No. 66, becomes assistant superintendent of factory No. 12.



## Summer Price Change In Steel Improbable

Serious Market Upset  
From Labor Situation  
Unlikely Leaders Think

NEW YORK—While the American Iron and Steel Institute placed the average rate of steel mills' operation at the beginning of this week at 56.9 per cent of theoretical capacity, a decline of half a point from the rate at the beginning of last week, finishing mills are maintaining an unchanged pace from the preceding week, in some cases amounting to virtually full capacity, chiefly so because of the need of completing within the next two weeks shipment of all orders now on mills' books at lower prices than those in effect for new business.

It seems to be a foregone conclusion in the steel market that July will show a sharp recession in activity, the general expectation being that by the latter part of August there should be indications of another upward turn. The conviction seems to be gaining more and more ground that what little stocking of steel there has been will have little or no effect on third-quarter demand. This period is usually a dull one in the steel market, and disappointment will not be keen if the market this year follows its usual form.

If consumers have stocked little, neither have the non-integrated rolling and finishing mills. At one time it was thought that these would stock considerable tonnages of semi-finished material, such as billets and sheet bars, which are much easier stocked than finished material that is apt to suffer damage in stocking, but latest developments indicate that



"Doctor" Bower

Buick's chief engineer F. A. Bower who received the honorary degree of Doctor of Science at commencement exercises at Villanova College

these mills also followed the policy of restricting their commitments to current needs.

While developments in connection with the steel industry's labor relations continue to give much uneasiness to the producers, they are no longer looked upon as a factor that might seriously upset the market.

Very little change in the market's price structure is looked for during the Summer and early Fall. Recent price reductions in the automotive industry have dampened the ardor of those who thought that further price advances in flat steels might be essayed later in the year. If the steel industry later in the year can recover or slightly better its present operating rate, little in the way of price changes is likely to be attempted.

## 3 Bankruptcy Trustees Appointed for Franklin

SYRACUSE—Three trustees in bankruptcy have been appointed for the H. H. Franklin Manufacturing Co., by Ben Wiles, referee. The trustees are Giles, H. Stilwell, Norman Knaus, Hugh H. Goodhart. Creditor banks, holding 90 per cent of the claims against the company, had nominated Mr. Stilwell as sole trustee, but agreed to the appointment of the other two trustees in compliance with the demands of certain of the minority creditors.

Referee Wiles has announced that the first meeting of creditors will be resumed June 25. It also was announced at the same time that several plans for reorganizing the company have been discussed but no definite plan has materialized.

## Auburn Omits Dividend

CHICAGO—For the first time since 1925 directors of the Auburn Automobile Company have voted to omit the regular quarterly dividend of 50 cents per share due next month.

## Willys-Overland Seeking RFC Loan

Reorganization Hinges  
Upon Grant; Complete  
7500 Cars This Week

TOLEDO—Reorganization of the Willys-Overland Co. here depends largely on the favorable action expected on an application for \$2,000,000 loan from the Reconstruction Finance Corporation which has been on file for a month, it was announced by David Wilson, receiver and president.

Mr. Wilson will go to Washington this week to carry additional operating data and figures in an effort to obtain the loan. If granted, the loan will be used for working capital to put into effect a plan on which bondholders, creditors and stockholders have been working for reorganization.

A loan of \$175,000 secured by receiver's certificates from local banks has been repaid. Manufacture of the 7500 cars approved by Federal Judge George P. Hahn will be completed this week.

It is held that the company has sufficient assets to satisfy the \$2,000,000 claim of bondholders and the \$8,000,000 claims of creditors filed against the property. Under the recent manufacturing program a large payment was arranged to be made to bondholders through sale of surplus machinery.

A big effort will be made to keep the plant in operation to give employment in view of the profitable operation and ready sale for the product.

## Report Midland Steel Purchases Packard Land

DETROIT—Midland Steel Products Co. has purchased a tract of land with 500 ft. frontage on Mt. Elliott Ave. from Packard Motor Car Co. It is reported that the company plans to build a plant on the site within the near future.

## May Class Maintenance Trade as Service Industry

PHILADELPHIA—It is reported that the NRA legal division is studying the automobile maintenance code with a view to determining whether or not it is to be classified as a service code. In the event it is it will be removed from NRA jurisdiction and allowed to go under regional trade agreements if the industry so chooses. The Blue Eagle will be issued by NRA, but the only jurisdiction the latter will retain will be the power to remove the Blue Eagle where complaints of violations are proven. Court action, if any, will be left to the regional authorities themselves.

## First Blood

WASHINGTON—First blood was drawn this week in the NRA code enforcement drive. Federal Judge Harry B. Anderson granted a permanent injunction against the Auto Sales Co. of Memphis, Tenn., restraining the defendant from violation of the Motor Vehicle Retailing Code. Auto Sales Co. was charged with transporting cars with disconnected speedometers.

This decree is considered of basic importance in NRA and automotive retail circles. Further violations on the part of the respondent would place him in contempt of a Federal court. The case was presented by United States District Attorney William Mc-Clanahan, assisted by W. F. Farrell, representing the new litigation division of NRA.

# New NRA Policy Raises Doubt as to Fate of APEM Supplements Pricing Provisions

WASHINGTON—All fourteen APEM product group supplements on which public hearings will be held during the week of June 25, make individual cost the standard below which sales may not be made, with the proviso that prices of a competitor whose costs are lower may be met. Other limitations are included in some of the supplements and some of these additional rules are briefly explained in the individual summaries appearing below. What the ultimate fate of the pricing provisions in these supplements will be can only be conjectured in view of NRA's recent announcement of its policy on price fixing. However, since NRA's policy conflicts sharply with practically all of the price provisions of the supplements, there naturally are grave doubts of their getting approval in their present form.

In addition to the price provisions, the supplements generally ban commercial bribery, dishonest or misleading advertising in various forms, consignment selling, lifting competitor's stocks, lump sum bidding, coercion, etc. Credit terms generally are specified in considerable detail. Many of the supplements include rules covering warehousing and usually these require that the member do his own, billing and selling, ban warehousing with customers, etc. Many of the supplements also include regulations covering the method of handling returned goods, warranties, price guarantees and volume allowances. Export business is exempted from the pricing provisions in all supplements.

The supplements all provide that NRA may appoint to the administrative committee a member to represent itself and also one to represent non-members of the group. The powers of the administrative committees include adoption of by-laws, etc.; collection of information; regulation of use of NRA insignia; hearing and adjustment of complaints, etc. All administrative committees are required to formulate uniform cost systems and, after approval by NRA, their use is obligatory. Expenses of administration are to be shared on the basis of volume of business and/or other equitable factors.

Further details on the individual supplements are given in the following summaries:

**Automotive Gasket Manufacturing**—Administration by executive committee of the Automotive Gasket Institute. Members must report individual overhead cost as determined by uniform accounting and from these reports will be selected the representative member whose overhead costs are lowest. Members may not sell below total of their individual labor and material costs plus such "lowest representative overhead cost." Provides for classification of customers and all customers in same class must receive same prices and terms. Prices for each classification must be filed and adhered to until changed. Prices effective when filed.

**Shop Equipment**—Administration by committee to which members are elected by each of five sub-product groups. Surplus and obsolete stocks, and new models are excepted from the cost recovery rule. Sets up standard warranty against de-

fective material and workmanship up to one year. Provides for classification of customers and all customers in same class must receive same prices and terms. Prices for each classification must be filed and adhered to until changed. New prices become effective a minimum of 10 days after filing. Members may enter resale price agreements with jobbers.

**Internal Combustion Engine Manufacturing**—Cover Diesel engines up to 20 hp. with certain exceptions in addition to Otto cycle engines. Administration by executive committee of the Internal Combustion Engine Institute. Cost recovery does not apply to price on new products provided price and terms are not below those of competitor selling for the lowest price which is not less than cost. Clean-up sales permitted at less than cost.

**Oil Filters**—Defines original equipment as Class A and replacements as Class B. Administration by committee elected in accordance with APEM By-Laws. Requires that rebuilt or reconditioned products have all marks of original maker removed, that they must be marked "Rebuilt" or "Used," and must be packed in plain carton carrying only maker's name and address and "Rebuilt or Used Oil Filter."

**Automotive Electrical, Lighting and Reflecting Devices**—Defines original equipment makers as Class A, replacement members as Class B and accessory members as Class C. Administration by committee consisting of three representatives elected by each group. Requires Class B and C members to file prices which become effective not less than 10 days thereafter. Members may not sell below filed prices. Provides that rebuilt and reconditioned products be so marked that there will be no doubts as to their nature.

**Piston Ring Manufacturing**—Administration by executive committee of Piston Ring Manufacturers Association. Requires classification of customers and all customers in same class must get same price and terms. Prices for each class must be filed and they become effective not less than 10 days thereafter. Cutting under filed prices is prohibited. Sets up eight price groups based on ring sizes. Administrative committee to appoint committee to cooperate with Bureau of Standards in setting up standards. Provides for the collection and distribution of monthly statistics on dollar and units sales by ring types to

original equipment makers, domestic after-market and export. Resale price maintenance contracts with jobbers would be permitted.

**Carburetor Manufacturing**—Defines original equipments makers as Class A and replacement makers as Class B. Administration by committee consisting of three representatives elected by each class. Prices on copied products must not be lower than those quoted by originator of design.

**Replacement Valve and Valve Parts Manufacturing**—Administration by executive committee of Automotive Replacement Valve and Valve Parts Association. When advisable, representative costs may be set as the price floor. Prohibits publication of list prices lower than those of motor vehicle or engine maker. Requires filing of all prices which become effective not less than 10 days thereafter, and adherence to filed prices. Requires classification of customers and that all customers in same class get same price and terms. Sets up standard warranty.

**Spark Plugs**—Defines original equipment makers as Class A, replacement makers as Class B. Administration by committee consisting of two members each selected by Class A and Class B. Rebuilt and reconditioned plugs must be plainly marked to show their nature.

**Wheel and Rim Manufacturing**—Defines original equipment makers as Class A and replacement makers as Class B. Administration by committee of six elected under APEM By-Laws. Requires customer to pay tool costs. Class B prices must be filed and they become effective not less than 10 days thereafter. Cutting under filed prices prohibited. Price filing provisions do not apply to sales to other members or to material sold to vehicle makers as Class A products.

**Radiator Manufacturing**—Defines original equipment as Class A and replacements as Class B. Administration by executive committee of Automotive Radiator Institute. Lowest representative overhead costs to be determined separately for Class A and Class B. Prices must not be less than labor and material plus such representative overhead. Class A customers must pay tool costs. Material prices as quoted in the American Metal Market on contract date to govern with certain limitations. Contracts must permit adjustments to meet revisions in code wages and hours. Class B members must file prices which become effective not less than 10 days thereafter. Cutting under filed prices prohibited. Clean-ups are excepted. Prices on new numbers become effective immediately. Requires classification of customers, all customers in same class to get same prices and terms.

**Replacement Piston and Pin Manufacturing**—Administration by executive committee of Piston and Pin Institute. Members required to file costs as determined by uniform accounting from which lowest representative cost will be determined. This lowest representative cost is the price floor. Prices established to meet car and engine makers' resale schedules are excepted from cost recovery provisions. Requires filing of prices which become effective after minimum of 10 days. Cutting under filed prices prohibited. Customers to be classified and all in same classification to receive same prices and terms.

**Powdered Metal Bearings**—Administration by committee of four elected under APEM By-Laws. Filing of prices is permissive.

**Replacement Water Pump and Parts**—Administration by executive committee of Automotive Water Pump and Parts Institute. Sales below cost permitted to meet car and engine makers' schedules. Requires price filing with changes to become effective not less than 10 days thereafter. Filed prices must be adhered to. Requires classification of customers with all customers in same class getting same prices and terms.

## N.A.C.C. Traffic Meeting

DETROIT—The Traffic Committee of the N.A.C.C. held a meeting for traffic managers of member companies Thursday of this week in the General Motors Building. The meeting was devoted to consideration of routine matters.



Walter P. Chrysler

President of the Chrysler Corp. who had been elected to the board of the N. Y. Central Railroad. Mr. Chrysler succeeds C. B. Seger, resigned





### This Dodge Traveled Far

The car was purchased in Sydney, Australia, and shipped by steamer to Lae, New Guinea. From Lae the Dodge was transported to Bulolo, also in New Guinea, by plane. The only parts which had to be removed to get the car into the plane were the top and windshield

## Another Diesel Session Added to S.A.E. Agenda

NEW YORK—An additional session under the heading "Diesel Fuels Session" has been added to the agenda of the S.A.E. Summer Meeting opening next week at Saranac Lake, N. Y. The session is scheduled for Tuesday, June 19, at 11.15 a. m.

Two papers will be presented under the auspices of H. D. Hill, S.A.E. vice-president, and his committee representing the Diesel Engine activity of the society. One paper, to be presented by A. L. Foster, National Petroleum Publishing Co., will be "The Outlook for Diesel Fuels and Their Available Supply"; the second paper, presented by H. G. M. Fischer and A. E. Becker, Standard Oil Development Co., is "An Index of Diesel Fuels Performance."

## Graham Reduces Prices; Range from \$20 to \$50

DETROIT—A reduction in factory list prices of Graham standard sixes ranging as high as \$50 has been announced by J. B. Graham, president, of the Graham-Paige Motors Corporation.

The reduction places the base price of the Graham standard six business coupe at \$695, Mr. Graham announced.

The new price schedule follows:

	New Price	Reduction
Standard six business coupe.....	\$695	\$50
Standard six coupe with rumble seat .....	765	30
Standard six sedan .....	775	20

Prices of other models of the Graham line are unchanged.

## Ab Jenkins To Seek More Records July 15

WASHINGTON—Ab Jenkins will attempt to add every automobile speed record up to 30,000 miles to his string on July 15 at the Bonneville Salt Bed near Salt Lake City. Jenkins will drive the same Pierce-Arrow car he used last year

in his record-breaking run on the same course, the only change being a streamline body. It is estimated the run will last 15 days. No relief driver will be employed.

## GMT Announces Reduction On 1½ Ton Truck Model

DETROIT—General Motors Truck Co. has announced a price reduction on the 1½ to 2 ton T-16 truck model, amounting to \$25 on short wheelbase chassis and \$30 on the long wheelbase, bringing the base price to \$570. The announcement stated that no further reductions were contemplated.

## Dodge Truck Price Cuts High as \$70

DETROIT—Price reductions on Dodge trucks ranging up to \$70 have been announced by Dodge Brothers Corporation. The reductions set a new base price of \$365 for the 111¼ in. wheelbase commercial car chassis which is within a few dollars of the lowest price the company has ever quoted on a truck.

The \$70 drop applies to three models of the 1½-ton series and brings the list price of the 1½-ton panel to \$750.

The new schedule of prices follows:

Commercial Cars 1½-ton 111¼ in.	
Chassis .....	\$365
Express .....	480
Canopy .....	590
Panel (119-in.) .....	595
Trucks	
Panel (¾-1, 1½-ton, 131-in.) .....	\$750
Chassis (1½-ton, 136-in.) .....	515
Chassis, Cab and Stake Body (1½-ton, 136-in.) .....	695
Chassis (1½-ton, 161-in.) .....	545
Chassis and cab (1½-ton, 161-in.) .....	640

Economies resulting from steadily mounting sales volume are responsible for the reductions, according to J. D. Burke, director of truck sales. Between January 1 and June 2, Mr. Burke says, truck sales totaled 18,534 as compared with 3,825 in the same period last year, a gain of 384.5 per cent.

## Hudson-Terraplane Cut; Add Hudson Challenger

DETROIT—Hudson has announced price reductions ranging from \$10 to \$50 on the Hudson and Terraplane lines, and the addition of a new Challenger series priced at \$685 to \$765 on the Hudson chassis. The following summary of recent price changes by Hudson shows that the new prices average somewhat higher than those in effect prior to the April increase:

Terraplane Prices		May	Reduc- tion	
Challenger				
2-p. coupe .....		\$565	....	
Coach .....		575	....	
4-p. coupe .....		610	....	
Sedan .....		635	....	
Special Six	March	April	New	Reduc- tion
2-p. coupe .....	\$565	\$610	\$600	\$10
Coach .....	590	625	615	10
Sedan .....	650	685	675	10
Comp. Victoria..	620	655	...	...
4-p. coupe .....	610	655	645	10
Comp. sedan ...	680	715	...	...
Conv. coupe ...	670	715	695	20
Major Series				
2-p. coupe.....		675	665	10
Coach .....	670	690	680	10
Coupe .....	690	720	710	10
Sedan .....	730	750	740	10
Comp. Sedan .....	760	780	...	...
Comp. Victoria..	700	720	...	...
Conv. coupe....	740	770	750	20
Commercial				
Chassis .....		415	405	10
Chassis with cab .....		490	480	10
Cab pick-up .....		525	515	10
Utility coach .....		540	530	10
Sedan delivery .....		605	595	10

Note—Compartment sedans and compartment Victoria models have been discontinued.

Hudson		New Model
Challenger Series		
2-p. coupe .....		\$685
Coach .....		705
4-p. coupe .....		735
Sedan .....		765

Special Series			March	April	New	Reduction
2-p. coupe	.....	\$695		\$735	\$725	\$10
Coach	.....	725		755	745	10
4-p. coupe	.....	745		785	775	10
Sedan	.....	785		815	805	10
Conv. coupe	.....	815		855	835	20
<b>DeLuxe Series</b>						
2-p. coupe	.....		825		815	10
Coach	.....	805		845	835	10
4-p. coupe	.....	825		875	855	20
Sedan	.....	865		905	895	10

Major Series				
Club sedan .....	995	1095	1070	25
Brougham .....	1095	1195	1145	50

Note—Compartment sedan and compartment Victoria models have been discontinued.

## \$15 to \$35 Reductions On Chrysler Six Line

DETROIT—Prices on the Chrysler six line have been reduced by amounts ranging from \$15 up to \$35. The new prices, however, run from \$5 to \$40 higher than those in effect prior to the April increases. A summary of recent changes in the list prices on this series follows:

Chrysler					
Six	March	April	New	Reduction	
Bus. coupe	...\$725	\$775	\$740	\$35	
R. S. coupe	...775	830	815	15	
Conv. coupe	...810	865	850	15	
Brougham	...755	795	760	35	
Sedan	...795	845	820	25	
Cl. Cp. sedan	...885	935	900	35	
Conv. sedan	...935	985	970	15	



## APEM Codes Most Directly Affected By New NRA Price Provision Policy

WASHINGTON — Most directly affected by NRA's June 7 announcement of a new policy on code price practices apparently will be the various APEM product group supplements of which three have had public hearings with 14 more scheduled for the "gold-fish bowl" during the week of June 25.

Since the new policy applies only to future codes, price control provisions in the motor vehicle retailing, automotive wholesale, motor bus and trucking codes are not affected and they continue in force—at least for the present. However, NRA is desirous of adjusting already approved codes to the new scheme of things by amendments worked out by agreement with code authorities. Consequently the future of the price control provisions in these automotive codes seems to depend on how insistent NRA is on having code authorities accept amendments which would bring these codes in line with the new policy. However, inasmuch as the present price control provisions are regarded by many members of these automotive codes as being their most important feature and as necessary to pay for higher labor costs, any attempt to make them conform to the new policy appears certain to meet with determined resistance.

### Will New Policy Control?

Despite NRA's declaration that changes in price provisions in approved codes to make them conform to the new price policy will be effected by agreement with the interested code authority, there is considerable opinion here that the death knell of price controls which do not conform to the new policy has been sounded. There may be exceptions, but in general many believe that codes to be approved and those that have been approved eventually will have to meet the new requirements. In fact, there are many who believe that ultimately codes may consist of nothing more than wage and hours sections, with a few simple trade practices.

The master APEM code, it will be recalled, makes it unfair competition to sell "at a price or upon such terms or conditions as will result in customer paying for the goods received less than the cost to the seller except under such special conditions as may be adopted by a Product Group in a supplemental code. . . ." To implement this section, all supplements scheduled for hearing during the week of June 25 make it unfair for a manufacturer to sell for less than his individual cost except where it is necessary to do so to meet the prices of a competitor whose costs are lower. In addition, some of the supplements establish the

prices established by vehicle or engine builders as the floor below which sales may not be made, some provide for resale price maintenance contracts with wholesalers, at least one calls for establishment of a standard overhead percentage to be applied to direct labor and material costs, another sets the "lowest reasonable cost" as the floor price for the group and a number of them set up open price filing plans with minimum waiting periods of 10 days before filed prices become effective. (A more detailed summary of the price provisions of the proposed supplements appears elsewhere in this issue.)

Provisions of the character just summarized as well as other features of the proposed supplements appear to be more or less in conflict with the new NRA policy which may be briefed as follows:

### NRA's New Rules

Fixing even of minimum prices will not be permitted except in emergencies which make such action necessary to halt destructive price cutting, protect small enterprises, curb monopolistic tendencies or to maintain code wages and working conditions. This precludes any direct prohibition against sales below cost or any other level except when NRA declares an emergency and fixes minimum prices as it has in the retail tire trade.

Open price provisions will be permitted where desired by an industry under conditions requiring posting of prices with a confidential, disinterested agency for distribution to all members of the industry and its customers willing to pay for the service. Prices filed become effective immediately and no higher prices may be quoted within 48 hours. It is, of course, unfair competition to sell for less than filed prices in effect. Where industries believe that there should be a waiting period before prices filed become effective, NRA will treat each case on its merits; otherwise the "no waiting period" policy will prevail.

Wilfully destructive price cutting is an unfair method of competition and is forbidden. On complaint of such price cutting, the Code Authority must allow the accused member five days to file an

answer and must rule on the complaint within 14 days. If the ruling is not accepted by the parties at interest, it goes to NRA for final determination. This provision, of course, does not apply during an emergency declared by the administrator during which he may set minimum prices as indicated above. The significance of this provision seems to lie in the fact that it does not attempt to set up any formula in a code for determining the figure below which sales must not be made, but instead puts destructive price cutting under a general ban, each complaint of such price cutting to be handled on its own merits. This gives a great deal more flexibility, and appears to have advantages from the administrative standpoint.

### Encourage Cost Finding

NRA will encourage the inclusion of model cost finding and accounting provisions in codes, but their adoption by members will not be obligatory, nor is it the intention that they will be used to encourage uniform additions in the form of percentages or differentials designed to bring about arbitrary uniformity in cost or prices.

No member of an industry shall enter into any agreement to fix or maintain prices. The reference here apparently is to the member's own prices, but the general tenor of the new policy suggests that resale price maintenance will not be looked upon with favor. In that event Article VI of the Automotive Wholesale Code would not be approved nor would the resale price maintenance provisions of several APEM supplements get by.

Of course, in the case of the APEM supplements, it might be argued that they do not constitute new codes, but instead simply implement the master code which was approved last November. If this contention is sustained, they would not be subject to the new NRA policy. However, NRA has indicated pretty clearly that it believes that codes already approved should be adjusted to the new policy so there is some reason for believing that the supplements will have to conform to the price policy laid down for future codes.

Just how much enthusiasm for codes both in and out of the automotive industry will remain if their price provisions must be amended to conform to the new policy, is conjectural. Many industries accepted the higher code labor costs and Section 7a in order to get the legal right to exercise some control over prices. If they are to have



New De Soto Town Sedan which is now in production

their powers in this direction very largely curtailed, many code members doubtless are going to feel that the game is not worth the candle. On the other hand, the number of business men who feel that the minimum wage standards established by the codes alone make them worth while, has grown steadily during the past year. Moreover, as experience has been gained in administering some of the price provisions of many codes, doubts as to their workability have increased. Many believe the general prohibition against destructive price-cutting, with each case to be decided on its own merits without inflexible rules to hamper the decision, as provided in the new policy, offers a more workable means of meeting the problem than the rigid standard written into many codes.

### Teachers Invited To Bendix Service School

**SOUTH BEND**—Teachers of automotive service trade and commercial schools anywhere in America have been invited to attend the Bendix Service School in South Bend, Ind., by executives of The Bendix Products Corp.

The entire course of the school is offered free. The regular course of the Bendix school extends over four weeks. Enrollment is accomplished by writing to the Bendix Service School, South Bend, Ind.



Crowds at last week's General Motors Show in Detroit

## General Motors Has Best May Since 1931—Dealer Stocks Increase 8,591

**NEW YORK**—General Motors sales in May reached the highest levels for that month since 1931. Aggregate sales to dealers here and abroad amounted to 132,837 units, making the five-month total 603,395, which is 69 per cent of the corporation's volume in all of 1933 and more than its total 1932 sales.

May sales to and by dealers in the United States indicate that domestic field stocks increased 8591 units during the month. In the first five months, the gain in dealer inventories amounted to 91,953.

Sales to customers in the United States in May aggregated 95,253, as reported last week in *Automotive Industries*. This total represented a loss of 11 per cent from April, but gains of 11 and 50 per cent respectively over the corresponding months in 1933 and 1932. Domestic retail sales in the first five months were 28 per cent ahead of last year.

May purchases by U. S. dealers amounted to 103,844, a gain of 33 per cent over last year but a decline of 15 per cent from April. The five-month total of sales to domestic dealers was 474,078, an increase of 45 per cent over 1933.

Sales to dealers in the United States

and Canada plus overseas shipments were 132,837, a loss of 14 per cent from April but an increase of 97 per cent over last year. The five-month total shows an increase over the same period in 1933 of 57 per cent to 603,395 units.

May deliveries of General Motors cars and trucks to large national fleet users exceeded any month on record, topping May last year by over 85 per cent.

General Motors sales abroad from all sources for the month of May totaled 23,994 units, the highest figure on record for any month since July, 1929. The May, 1934, volume represents an increase of 112 per cent from May, 1933. American-source sales predominate in this total, and show an increase of 168 per cent from the corresponding month a year ago.

Sales from the corporation's English and German sources at Vauxhall Motors, Ltd., and Adam Opel A. G., respectively, also reveal encouraging gains.

For the first five months of 1934 General Motors overseas volume has reached a total of 83,811 units, an increase of 93 per cent over the total in the corresponding period in 1933.

A summary of the corporation's monthly sales report follows:

	May, 1934	April, 1934	May, 1933	Five Months 1934	Five Months 1933
Sales to U. S. Consumers.....	95,253	106,349	85,969	382,125	297,937
Sales to U. S. Dealers.....	103,844	121,964	85,980	474,078	327,806
World Sales to Dealers.....	132,837	153,954	98,205	603,395	384,921

### Ad Men to Hear L. G. Peed On Aerodynamic Styling

**DETROIT**—L. G. Peed, general sales manager of the De Soto Motor Corporation, will represent the automobile industry in an advertising clinic to be held at the Hotel Pennsylvania in New York City, June 20, in connection with the annual convention of the Advertising Federation of America, it was announced here today.

Mr. Peed is expected to discuss aerodynamic styling in motor cars and the value of educational advertising as applied to new products. The clinic will be conducted by John B. Kennedy, editor, economist and radio commentator, and will be broadcast over a national radio network.

### Nash Promotes Four

**KENOSHA**—Four promotions in the Nash-LaFayette field organization are announced by Courtney Johnson, general sales manager of the Nash Motors Company.

They are appointments of J. M. Mugley to regional manager of Nash-LaFayette sales in the south, with headquarters in Memphis, Tenn.; W. C. Garis as regional manager of the Central West territory with headquarters in Kansas City, Mo.; D. C. Boden, regional manager with headquarters in Cleveland, and F. C. Hammons, regional manager with headquarters in Oakland, Cal.

### Inland Co. to Build

**DAYTON**—The Inland Manufacturing Co., a GM subsidiary, has announced the letting of contracts for construction of a \$325,000 factory building adjacent to the present plant. The new building is to be completed within four months to begin the manufacture of products for next year.

# Business in Brief

Written by the Guaranty Trust Co., New York, exclusively for Automotive Industries

The rate of general business activity was fairly well maintained last week, despite the seasonal influences making for curtailment and the effects of drought over wide agricultural areas. Business sentiment responded favorably to the success of negotiators in averting the threatened strike in the textile industry. The improvement was reflected in the stock market, where prices showed more firmness than had been visible in many weeks.

## Freight Declines

The movement of railway freight declined during the week ended June 2, but remained well above the level of a year ago. Loadings during that period totaled 578,541 cars, showing a decrease of 46,026 cars, or 7.3 per cent, from the figure for the preceding week, but an increase of 65,657 cars, or 12.8 per cent, above that in the corresponding period last year and a gain of 131,129 cars, or 29.3 per cent, above that for the similar period in 1932.

## Electric Production

A similar trend is visible in electric power output. Production of electricity by the electric light and power industry of the United States for the week ended June 2 was 7.8 per cent larger than that in the corresponding period last year, showing, however, the smallest percentage gain over the like period of the preceding years since last December.

## Lumber Movement Hindered

The lumber movement during the week ended June 2 was the lowest of any week since January, with production, shipments, and orders all declining to mid-winter levels. The recession is attributed partly to the Decoration Day holiday and partly

to the longshoremen's strike on the Pacific Coast, which is tying up all water shipments.

## Silk Imports Gain

Raw silk imports into the United States during May totaled 38,717 bales, which is 3070 bales above the total for April, but 5521 bales under that for May, 1933. Deliveries to mills amounted to 38,740 bales, showing a gain of 1348 bales over the April figure, but a decline of 8411 bales below that for May of last year.

## Crude Oil Drops

Average daily crude oil production during the week ended June 2 amounted to 2,453,400 barrels, showing a decline of 39,100 barrels from the average for the preceding week. The current figure is lower than the new Federal allowable output which became effective on June 1, by 74,900 barrels, and compares with an average daily production of 2,675,650 barrels for the corresponding period last year.

## Fisher's Index

Professor Fisher's index of wholesale commodity prices for the week ended June 8 stands at 75.9, as against 75.8 a week before, 75.5 two weeks before, 75.4 three weeks before, and 75.2 four weeks before. The present average is the highest for the year to date.

## Federal Reserve Statement

Reserve bank credit outstanding increased \$5,000,000 during the week ended June 6, with a decline of \$5,000,000 in bills discounted more than offset by a rise of \$9,000,000 in other Reserve bank credit. The monetary gold stock increased \$14,000,000, and member bank reserve balances, \$24,000,000.

## NRA Industrial Advisory Board Holds Conference

WASHINGTON—Invitations have been sent to all present and past members of the NRA Industrial Advisory Board for a three-day conference at Hot Springs, Va., beginning today (June 16).

It is expected that General Johnson will go to the southern spa to address the Board before his scheduled address at Charleston, W. Va. George H. Mead, president of the group, issued the invitations.

Included in the present membership of

the Board is John J. Raskob, member of the GM Board of Directors. Former members of the Board who have been invited to the meeting include Alfred P. Sloan, Jr., president of GM, and Pierre S. duPont, chairman of the board of the duPont company and a member of the GM board.

## Verne W. Schlieder

DETROIT—Verne W. Schlieder, field secretary of the National Standard Parts Association, died suddenly in St. Paul, Minn., on June 8, while en route to De-



Verne W. Schlieder

troit from an extended trip through the western states. He was 44 years old and is survived by his wife, a son, a sister and his mother.

## Gasket Co. Moves

DETROIT—Detroit Gasket Manufacturing Co., will move its factory from E. Milwaukee Avenue, to a newly acquired plant located in Brightmoor. The location was formerly occupied by Peninsular Stove Co., and recently purchased by Detroit Gasket Manufacturing Co. The factory alone contains 230,000 sq. ft. of floor space in addition to its two story administration building.

## Templin Wins Dudley Medal

PHILADELPHIA—R. L. Templin, chief engineer of tests, Aluminum Co. of America, has been awarded the Charles B. Dudley Medal for 1934, given annually by the American Society for Testing Materials to the author of the paper presented at the preceding annual meeting which is of outstanding merit, and constitutes an original contribution to research in engineering materials. Mr. Templin's paper was entitled "The Fatigue Properties of Light Metals and Alloys."



## 63% of Dealer Purchases of New Cars in First Quarter Were Floor Planned

CHICAGO — Statistics of wholesale financing in the first quarter indicate that finance companies supplied more than 63 per cent of the capital required by dealers to finance their inventories of new cars, according to the National Association of Finance Companies.

Wholesale financing in the first three months of this year averaged \$299.54, the N.A.F.C. finds, for each new car purchased by dealers from the factories. This figure is 63.2 per cent of the 1933 average factory selling price for new cars of \$474. In other words, of the money received by factories in the first quarter for cars shipped to dealers, the finance companies furnished this percentage of the total. Obviously the finance companies have become the dominant source of the capital dealers need for inventory financing. The following table gives detail figures for each of the first three months of the year and for the first quarter as a whole:

	Wholesale Financing			
	Vehicles Produced Less Exports	Amount	Dollars of Per Factory Car	Per Cent of Price
January	149,828	\$ 36,577,358	244.13	51.5
February	220,473	62,551,490	283.71	59.9
March	309,776	104,581,339	337.60	71.2
Total	680,077	203,710,187	299.54	63.2

There were only two months in 1929 in which the volume of wholesale financing of automobiles of the reporting finance companies was as great as one-half of the volume of retail financing, while in 1933 the volume of wholesale financing exceeded one-half of the volume of retail financing in all but two months of the year. For the entire year of 1929 the volume of wholesale financing was 41 per cent of the volume of retail financing, whereas the corresponding figure for 1933 was 79.7 per cent. In Janu-

ary, 1934, for the first time, the volume of wholesale financing exceeded that for retail financing and this ratio increased greatly in February and March.

The monthly rates of wholesale to retail financing are portrayed in the accompanying chart.

### Big March Gasoline Consumption Noted

NEW YORK—A considerable increase in gasoline consumption was registered in March both over February of this year and March, 1933. The total consumption for March throughout the country was 1,253,433,000 gallons, against 1,116,078,000 gallons for the same month one year ago and 1,048,262,000 gallons for the preceding month of this year. The figures were compiled by the American Petroleum Institute.

For the three months of 1934 (ending on the last day of March) the consumption increased 339,118,000 gallons over the corresponding 1933 quarter. This year's first quarter consumption was 3,462,800,000 gallons against 3,123,682,000 for the same period of 1933.

### C. M. Luthy Changes Job

CLEVELAND—Charles M. Luthy, formerly general sales manager of the Chain Products Co. of this city, has become associated with the Cleveland Chain and Manufacturing Co. as assistant general sales manager. He was connected with the Chain Products organization for about 14 years.



V. A. Olsen

Whose appointment as works manager of Cadillac Motor Car Co. has been announced by Nicholas Dreystadt, Cadillac general manager. Mr. Olsen has been connected with the Cadillac organization for 16 years.

### Shorter Truck-Trailers Required by New N. Y. Law

NEW YORK—Shorter trucks and trailers will be required in this state by virtue of an amendment to existing laws covering combinations of vehicles. Heretofore the law has permitted vehicle combinations up to 65 feet in length. The new amendment prohibits combinations greater than 50 feet in length.

Under the amendment an exception is granted to vehicles, or combinations thereof, in excess of 50 feet, which were registered prior to May 9 of this year, may continue to operate on the highways until February 1, 1938.

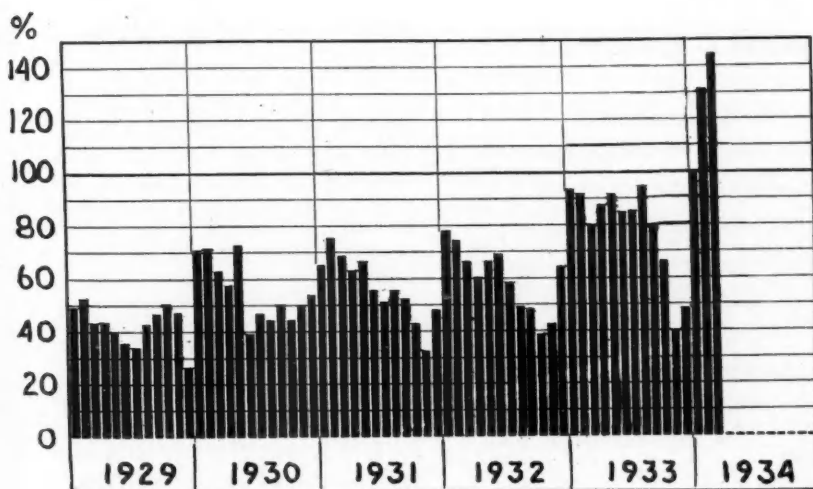
### Sterling Truck Ships to New Zealand via Water

MILWAUKEE—This city has become a port of departure for cargo consigned to the Antipodes. Two motor trucks built by the Sterling Motor Truck Co., were loaded during the past week on a vessel destined for Auckland, New Zealand. They were shipped boxed and unassembled, not only for convenience in handling but to take advantage of a preferential tariff rate.

The Sterling shipment followed by a short time the shipment of 10 Nash cars for Australia and New Zealand ports, thus inaugurating an all-water transportation route between Lake Michigan ports and the other side of the globe.

### Shuler Reelects Dugan

LOUISVILLE—W. E. Dugan was re-elected president and general manager of the Shuler Axle Co., Inc., of this city at a meeting of the Board of Directors held here June 7.



Dollar volume of wholesale financing as a percentage of retail financing

## Cost of Depression Put at \$108 Billion

**Business and Investors  
Sustain Two-Thirds of  
Loss; Workers One-Third**

NEW YORK—The three years of depression from 1930 to 1932 cost the American people about \$108 billion, according to the National Industrial Conference Board. Of this amount, nearly two-thirds was suffered by business proprietors and investors and a little more than one-third by employees.

Taking the income level of 1929 as a basis, the total loss to employees in wages and salaries received in 1930, 1931 and 1932 exceeded \$37 billion.

The reduction in produced income available as a return for persons in business for themselves, recipients of rents and royalties, and for interest and dividends on invested capital was \$47.4 billion. Business losses reduced assets of individual proprietors and of corporations during these three years by \$23.2 billion, making the total cost to business \$70.6 billion. Thus the aggregate cost of the depression, in reduction of income and in capital used up during the three years, was about \$108 billion. The cumulative losses suffered by business during this period was nearly twice as great as the loss of income to employees working for wages and salaries.

In the period during which the produced national income fell off 52.6 per cent, the amount of national income that was paid to employees fell 40.3 per cent, while other than labor income declined 74.1 per cent.

The balance of income produced, after subtracting labor income paid out, formed 36.4 per cent of the total income produced in 1929, and 19.9 per cent in 1932. In amount, such income fell from \$30.2 billion in 1929

to \$7.8 billion in 1932, while in the same period labor income fell only \$52.8 billion to \$31.5 billion.

In some of the largest industries in 1932, employees received more than the income produced, and business capital was used to pay wages and salaries. In trade, the amount that was paid out in wages and salaries was 3.5 per cent more than the total income produced; in manufacturing, wages and salaries paid were 18.5 per cent in excess of the total income produced; and in construction, the payments to employees were 51.8 per cent more than the total income produced by the industry in that year.

From 1929 to 1932 interest and dividend payments to savings institutions and to individuals with annual incomes of less than \$10,000 declined from \$7.5 billion to \$6.9 billion, or 7.7 per cent, while payments to individuals with annual incomes of \$10,000 or over decreased from \$4.7 billion to \$1.5 billion, or 67.1 per cent. In the same period, dividends dropped from \$6 billion to \$2.6 billion, or 56.6 per cent, while interest payments decreased only from \$5.7 billion to \$5.5 billion, or 3.3 per cent.

### Twin Coach Co.

KENT, OHIO—The Twin Coach Co. reports a net profit of \$86,508 for 1933 against net loss of \$51,107 for 1932. Current assets on Dec. 31 included cash, \$224,982; receivables, \$552,139; inventories, \$441,509; current liabilities included notes payable, none; accounts payable, \$233,858.

### Rolls-Royce of America

SPRINGFIELD, MASS.—Rolls-Royce of America, Inc., reports a net loss for 1933 of \$267,274 against \$431,526 for the previous year. Current assets on Dec. 31, were \$915,604, with current liabilities of \$498,630. Current assets included cash, \$53,416; notes and accounts receivable, \$180,513; inventories, \$681,675. Current liabilities were notes payable, \$28,000; accounts payable, \$50,919; Brewster & Co. stock purchase, \$31,500; customer deposits, \$37,162; accrued interest, \$282,578, accrued wages, taxes, etc., \$68,471.

### Russell Motor, Ltd.

WEST TORONTO, ONT.—Russell Motor Car Co., Ltd., reports a net profit of \$37,372 for 1933 against a net profit of \$67,894 for 1932. Current assets Dec. 31, were \$554,831, with current liabilities of \$84,000. Current assets included cash, \$254; accounts receivable, \$27,681, marketable securities, \$526,896. Current liabilities included bankers' advances, \$76,000; unpaid dividends, \$8,000.

### Stutz Motor Car Co.

INDIANAPOLIS—A net loss of \$457,826 for the year ending Oct. 31, 1933 against \$315,190 for the previous year is reported by the Stutz Motor Car Co. Current assets, Oct. 31 were \$188,065 with current liabilities of \$69,708. Current assets included cash, \$42,589; accounts receivable, \$12,036; inventories, \$133,441; current liabilities included accounts payable, \$30,043; accruals, \$39,665.

### Continental Motors Corp.

DETROIT—For the six months' period ending April 30, Continental Motors Corp. reports a net loss of \$905,940 compared with \$1,432,918 for the same period last year. Current assets on April 30, including \$192,923 cash, amounted to \$1,296,891. Current liabilities were \$650,908.

### Johnson Motor Co.

WAUKEGAN—Johnson Motor Co. reports a net loss of \$41,174 for the nine months ending Sept. 30, 1933. Current assets of that date were \$511,772 against current liabilities of \$52,500. Current assets included cash, \$251,324; tax refund received, \$22,393; accounts and note receivable, \$68,661, inventories, \$169,394. Liabilities included accounts payable, \$25,429, accruals, \$24,071, and provisions for advertising, \$3,000.

### Franklin Mfg. Co.

SYRACUSE—The H. H. Franklin Manufacturing Co. reports a net loss for 1933 of \$819,186 against a net loss of \$1,127,253 for 1932. The total current assets as of Dec. 31 were \$616,403; total liabilities were \$2,521,174.

Current assets included cash, \$38,132; sight drafts, \$3,667; accounts and notes receivable (net), \$42,515, and inventories, \$532,089. Liabilities included loans payable, \$2,163,000; accounts payable, \$358,174.

### Perfect Circle Dividend

HAGERSTOWN, IND.—The regular quarterly cash dividend on 162,500 shares of stock outstanding was recently declared by the board of directors of The Perfect Circle Company. The dividend amounting to 50 cents a share, is payable July 1, to stockholders as of record June 15.

### John Warren Watson Co.

PHILADELPHIA—The John Warren Watson Co. reports a net loss of \$225,446 for 1933 against \$214,026 for the previous year. Total current assets of the company as of Dec. 31 were \$132,517, with total current liabilities of \$79,633.

## CALENDAR OF COMING EVENTS

### SHOWS

American Transit Assoc., Cleveland, Ohio .....Sept. 22-27  
Cleveland (Automotive Service Industries) .....Nov. 19-23

### MEETINGS

S.A.E. Summer Meeting, Saranac Lake, N. Y. ....June 17-22  
American Society for Testing Materials, Atlantic City, N. J. ....June 25-29  
American Chemical Society, Cleveland, Ohio .....Sept. 10-14  
American Welding Society, New York City .....Oct. 1-5

### ANNUAL MEETINGS

Natl. Assoc. of Motor Bus Operators, Cleveland .....Sept. 21-22  
Natl. Safety Council, Cleveland, O., Oct. 1-5

### CONVENTIONS

American Society for Metals, New York City .....Oct. 1-5  
American Transit Assoc., Cleveland Sept. 24-27  
International Foundry Congress, Philadelphia .....Oct. 22-26  
American Foundrymen's Assoc., Philadelphia .....Oct. 22-26  
National Foreign Trade Council, New York .....Oct. 31-Nov. 2

### EXPOSITION

Natl. Exposition of Power & Mechanical Engineering (Biennial) New York, N. Y. ....Dec. 3-8

# JUST AMONG OURSELVES

## 467 Cu. In. Engines for Motor Trucks

AT the recent Washington meeting of the National Conference on Street and Highway Safety, there were written into the proposed Uniform Motor Vehicle Code several provisions regarding motor trucks which are unfair—and in one instance at least totally unworkable. (See *Automotive Industries*, June 2, page 665.) Reversing the decision of a subcommittee which had studied the details carefully, in the open meeting of this conference a "performance ability" provision was incorporated in the proposed uniform law. Part of this provision suggests that in hilly terrain every truck be required to demonstrate its ability to negotiate a 6 per cent grade at 20 m.p.h. For the average single unit truck of 5-ton capacity with an average gross weight of 25,000 lb., we are reliably informed, this will necessitate the use of an engine of approximately 467.5 cu. in. displacement, operating at approximately 2400 r.p.m.

So far as we know, none of the truck manufacturers have engines of this size available at this time—and there is no economic reason why they should have.

\* \* \*

## Why Let Railroads Write Truck Laws?

HEADED "How's Your Imagination," a heated, but perhaps not too violently exaggerated, comment on this situation has just reached us from a prominent and experienced truck executive.

"Can you picture," he writes, "a delegation of 59 or more motor truck operators being admitted to a railroad safety conference and permitted to discuss and vote on such questions as the size and weight of locomotives and cars, the length of freight trains and the minimum speeds at which they must ascend a — per cent grade?"

"An experienced railway engineering authority, let us assume, has made certain recommendations in order that there may be greater uniformity as between the several railroad systems which will promote an interchange of equipment and reduce rehandlings of freight and passengers.

"For reasons best known to themselves, the truck operators decide that this program of the railroads will divert freight and passenger traffic from highway to railway and must be opposed.

"So they get into this conference—which for some unknown reason has no committee on credentials and no qualifications for voters—and attempt to put over a substitute program leaving questions of weight to each individual railroad for determination on the theory that the existing confusion, further confounded, will benefit the interests of competing agencies.

"I ask you!

"Yet this in effect is the program carried out by the railroad interests at the recent highway safety conference under the auspices of the National Conference on Street and Highway Safety.

"It should be recognized officially as the most brazen bit of business effrontery perpetrated during 1934!"

## Some Job!

ALL over the United States men are traveling about, meeting in smoke-filled rooms and arguing about development or administration of codes. All day, every day code administrative officials are answering questions, making decisions, settling arguments. Every question, every answer, every move costs money. As one sits back and thinks about it all, one gets that "gone" feeling which comes from the attempt to grasp mentally the concept of "eternity." Try it sometime.

The automobile dealer code authority for Pennsylvania District No. 1 alone lays claim to the following activity in a single month: 40 bulletins issued, 600 copies of each having been mimeographed, addressed and mailed; 1974 used car sales reports checked; 286 complaints investigated; 175 calls on dealers made by checkers; 2348 parts and accessory discount cards issued; 25 sales closed with assistance of the code authority office in selling the code to the customer. The code phone rings every 4 minutes!

\* \* \*

## Two Men for One Job

ADD Federal Coordinator of Transportation J. B. Eastman to the growing list of public men with vision to see and courage to expound the fallacy of putting two men to work on a job that needs only one.

"Shorter work days, except to supply needed opportunity for rest, leisure and recreation," he says, "are merely a counsel of despair and a confession of inability to solve the problem as it should be solved."

When plenty exists side by side with poverty, the difficulty lies in the realm of distribution and the paradox is not likely to be resolved by getting rid of the plenty. Nor is a problem of maladjustment in distribution to be solved by creating inefficiency in production.—N. G. S.



# AC Begins Production Bronze-Lined, Steel

**P**RODUCTION of high-leaded bronze lined, steel-backed bearings for automotive and aircraft engines is scheduled to get under way about June 15 at the Flint plant of the AC Spark Plug Company. Entry of AC in this field represents primarily a transfer of this activity within the General Motors Corporation, from Allison Engineering Corporation, as a result of the intense interest in higher load capacity bearings which has developed among car, truck, and bus producers, and the large scale production requirements thereby indicated.

Many automotive engineers today agree that the neck in the bottle preventing in numerous cases, further marked increases in specific engine outputs is the question of load capacity and life of crankshaft and connecting rod bearings. The high output of even many present day automotive engines would not have been possible had it not been for such fac-

tors as the virtually universal counterweighting of crankshafts for reduction of main bearing loads, the use of aluminum pistons and in some cases aluminum rods to reduce crankpin loads and the adoption of oil temperature regulators to keep bearing temperatures below the critical range.

It is not expected that the industry as a whole will make a sudden switch away from babbitt-lined main and connecting rod bearings, but already a number of important truck engine producers and two major automobile manufacturers have adopted the high load capacity types and at least another prominent automobile manufacturer will go to these bearings within the next few months. Several more are indicated as likely to follow when 1935 models are introduced.

There are apparently two basic bearing problems which have brought about this condition. These are:

1. The rapidly decreasing resistance of babbitt to fatigue failure with increasing loads and temperatures, and
2. The inability at present of achieving a strong enough bond under high temperatures of the babbitt to its backing to prevent babbitt chips from falling out of the bearing when fatigue cracks occur.

Neither these problems nor the use of high leaded bronze bearings of course, are new. Such bearings are almost universally used today on aircraft engines and are mainly responsible for the high specific output of such engines.

In the case of Allison, the development of these bearings dated back originally to studies of failures of connecting rod bearings on Liberty Aircraft engines during and after the war. These studies showed that repeated flexing of the original bronze backing for the babbitt bearings used caused a fatigue failure of the bond between the bronze and the babbitt.

An intermediate step was the substitution of steel for the bronze backing, the bearings remaining babbitt lined. In aircraft engines this apparently results in increasing the life of the bearings some four to five times according to competent authorities.

The relatively low resistance of babbitt itself to fatigue failure under high loads and temperatures brought about the second development at Allison—adoption of a bronze lining with a high lead content, still further to increase bearing life and load capacity. The use of a high percentage of lead content is to achieve a coeffi-



William P. Anderson, who has been identified with the bearing activities of the Allison Engineering Co., will head AC's bearing division

June 16, 1934

*Automotive Industries*

# n of High-Leaded el Backed Bearings

by A. F. Denham

Detroit Editor, Automotive Industries

cient of friction for these bearings somewhat comparable to that of bab-bitt.

In spite of the widespread use of these bearings in the aircraft engine field it has been only in the past year that some automobiles and trucks are using them.

The bearings require a very strong bond between the bronze and the steel. In this respect William P. Anderson, manager of the bearing division of AC, says that the bond has a higher strength actually than the leaded bronze itself. Fracture in a tensile test therefore occurs in the bronze rather than at the bond. Moreover such a bond has a high resistance to temperature and does not weaken in the same manner, as the tin bond used with babbitted bearings.

The art of producing leaded bronze bearings has now reached a stage where they can be made commercially in any quantities and to consistent manufacturing standards. Furthermore, such bearings when run on a bearing test machine are reported to withstand loads, speeds, and temperatures in excess of those of babbit-lined bearings. For instance, a  $\frac{5}{8}$ -in. width connecting rod liner, the tests show, can be run successfully on the bearing machine at 4500 r.p.m., with a load of 2750 lb. per sq. in. and an inlet temperature for fresh S.A.E. 30 oil of around 550 deg. F.

Basically, the advantages accruing from increased bearing load capacities would enable:

1. Increase in engine speeds of present engines beyond the limitations imposed by the load capacities of present bearing materials.
2. A resultant increase in horsepower per cu. in. potential without increase in engine size or weight.

## Ability of new bearings to withstand higher loads and speeds points to increased engine output and possible reduction in overall length

3. The possibility of shortening present engines by permitting the use of narrower bearings.
4. The possibility of going to multiple cylinder in-line construction in the lower price classifications without material increase in engine (and therefore wheelbase) length, since narrower bearings can be used.
5. Possibility of eliminating the need for oil temperature regulators on some engines.

While one problem with these bearings in the past has been to obtain coefficients of friction comparable with those of babbit linings, test results show that the actual materials developed have a high inherent resistance to seizure. Such bearings have actually been run on test machines at high loads and speeds with the journal oil hole plugged up, and while subsequent examination showed the development of intense heat at the bearing, turning the journal blue, no trace of seizure or scoring was noticeable and the bearing itself was in good condition.

At the present time AC has four basic types of high leaded bronze alloys ranging from around 15 to 45 per cent lead content. These alloys have been developed to suit the following requirements:

1. High loads, low velocities, internal liners.

2. High load, low velocities, external liners.
3. High loads, high velocities with hardened journals.
4. High loads, high velocities, comparatively soft journals.

Other apparent facts developed as the result of actual operations include the following:

1. Wear seems to be a function of the hardness of the bronze.
2. Most of the wear occurs in the first few hours of running.
3. For thin wall liners flanged shells seem to have sufficient advantages in resistance to change in shape in operation to offset the slight added manufacturing cost.
4. Except for bearings taking thrust loads such flanges need not be bronzed.
5. Best clearance for fitting these bearings has been found to average around 0.001 in. per inch of diameter of the bearing.
6. Thin shell bearings require stiff backing and localized loading must be avoided.

Design and manufacture of the bearings at AC will be under the direct supervision of William P. Anderson, manager of bearing division, who has been identified with this activity at Allison Engineering Company. Production will include bearings for the aircraft as well as the automotive industry.

by Chris H. Bouvy

SEE JULY 14, 1934 (FOR ERRORS)

# Triple-Curve Space Puts

THE conventional contour for a cam intended for use with a mushroom tappet—composed of a circular-arc nose and a circular-arc flank—is far from ideal when space limitations make it impossible to use a tappet of sufficient diameter to obtain the required lift. Lift decreases in almost direct proportion with the permissible tappet diameter. Mathematical analysis shows how this deficiency can be corrected in a very simple manner.

## Analysis of the Conventional Cam

Fig. 1-a shows an ordinary mushroom cam in contact with a flat follower at that point of its contour which marks the end of the flank and the beginning

of the nose. It is at this point that acceleration ceases and deceleration begins, and it is therefore generally referred to as the point of reversal. The angular position of the cam for motion of the tappet in contact with the nose is defined by the angle  $\theta$ , which is measured from the apex of the nose, and that for motion on the flank by the angle  $\phi$ , which is measured from the beginning of the lift, where the flank arc meets the cam base circle.

From the geometry of Fig. 1-a we arrive at an expression for the lift. For motion of the tappet in contact with the nose we can write—

$$\text{Fall} = E_n(1 - \cos \theta),$$

and for motion in contact with the flank—

$$\text{Lift} = E_{f1}(1 - \cos \phi).$$

$$V_n = \frac{dL}{dt} = E_n \sin \theta \frac{d\theta}{dt} \quad (\text{on nose})$$

$$V_{f1} = \frac{dL}{dt} = E_{f1} \sin \phi \frac{d\phi}{dt} \quad (\text{on flank})$$

In these equations  $d\theta/dt$  and  $d\phi/dt$  are equal to the angular velocity of  $\omega$  of the cam which is constant and is expressed in radians per second. Therefore,

$$V_n = E_n \omega \sin \theta \quad (\text{on nose})$$

$$V_{f1} = E_{f1} \omega \sin \phi \quad (\text{on flank})$$

$$\text{Acceleration} = \frac{dV}{dt} \text{ or,}$$

$$A_n = E_n \omega^2 \cos \theta \quad (\text{on nose})$$

$$A_{f1} = E_{f1} \omega^2 \cos \phi \quad (\text{on flank})$$

For unit angular velocity (one radian per second), corresponding to  $30/\pi$  r.p.m., the expressions for velocity and acceleration become:

$$V_n = E_n \sin \theta \quad (\text{on nose})$$

$$V_{f1} = E_{f1} \sin \phi \quad (\text{on flank})$$

$$A_n = E_n \cos \theta \quad (\text{on nose})$$

$$A_{f1} = E_{f1} \cos \phi \quad (\text{on flank})$$

A study of these expressions reveals the following important facts:

(1) The tappet motion is analogous to the motion of a piston derived from a crank rotating at uniform angular velocity through the intermediary of a connecting rod of infinite length. Hence the conclusion that the tappet motion is made up of portions of two simple harmonic cycles of different amplitude, on the flank and the nose of the cam respectively.

(2) The flank eccentricity  $E_{f1}$  and the nose eccentricity  $E_n$  represent the respective crank throws and are the only basic cam dimensions. In other words, changing the nose radius or the flank radius without changing the nose and flank eccentricities has no effect on the characteristics of the cam.

(3) If we make the total deflection of the valve spring equal to the nose eccentricity  $E_n$ , the spring load is a constant function of the deceleration of the tappet motion on the nose. This can be proven as follows:

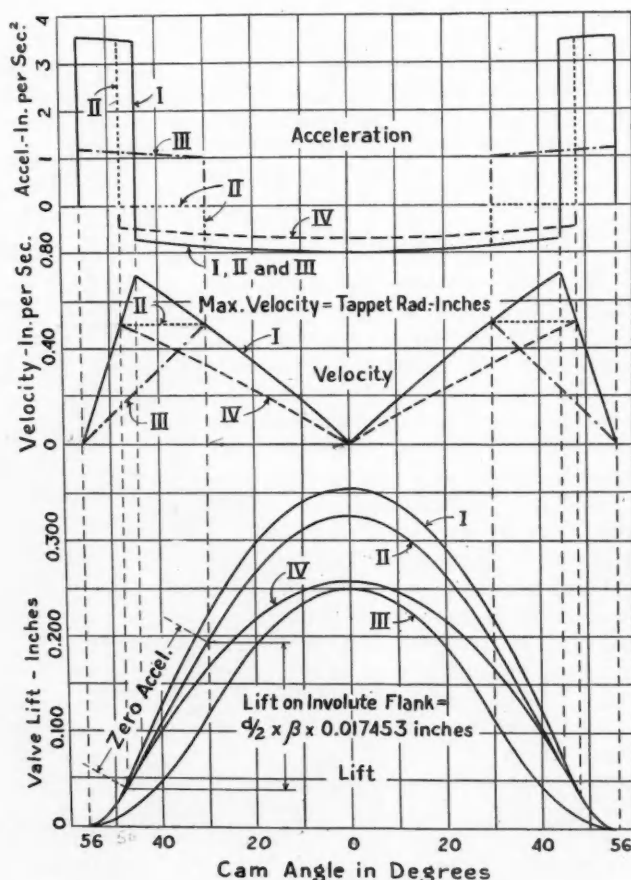
We have seen that

$$F_n = E_n(1 - \cos \theta) \quad \text{and}$$

$$A_n = E_n \cos \theta$$

For  $\theta = 0$  degrees

Fig. 1—Lift, velocity and acceleration curves for four cams for use with flat followers. Cams I, III and IV are similar and are illustrated by Fig. 1-a, while cam II, which first gives an upward acceleration to the follower, then maintains it at constant speed, and finally allows it to decelerate, is illustrated in Fig. 1-b





# Cam Gives Maximum Lift Where Limit on Tappet Head Diameter

How to get maximum lift for a given tappet head diameter is a problem engineers are sometimes called upon to solve when the engine design limits this dimension, as may happen, for example, in a Vee engine. The tappet head, of course, must have sufficient diameter always to be tangent to the cam outline so that the edge of the tappet will not dig into the cam.

A triple-curve cam, instead of the usual double-curve type employed with mushroom followers, offers a solution of this problem as it permits use of a tappet head of smaller diameter. This cam has first an outline giving constant, rapid acceleration to the valve up to its maximum speed, then an involute form maintaining the upward speed of the valve constant for a period, and finally a circular arc nose which decelerates the valve until its upward speed is zero.

The accompanying article explains the design of such a cam.

$$F_n = 0 \quad \text{and} \quad A_n = E_n$$

For  $\theta = 90$  degrees,

$$F_n = E_n \quad \text{and} \quad A_n = 0$$

If, instead of measuring the fall from the top of the nose, we measure the lift from the position corresponding to  $\theta = 90$  deg., we can write:

$$L_n = E_n \cos \theta \quad \text{and}$$

$$A_n = -E_n \sin \theta \quad \text{so}$$

$$L_n = -A_n.$$

That is, the lift in inches is equal to the deceleration in inches per second per second for any value of  $\theta$ .

For  $\theta = 90$  degrees

$$L_n = 0 \quad \text{and} \quad \text{Dec}_n = 0$$

For  $\theta = 0$  degrees

$$L_n = E_n \quad \text{and} \quad \text{Dec}_n = E_n$$

The required spring load is zero for  $\theta = 90$  deg., and maximum at the top of the nose when  $\theta = 0$ , when the compression of the spring equals  $E_n$ , which in turn must be equal to the total deflection of the valve spring. By "total deflection of the valve spring" is meant, of course, the difference between its free length and the length of the spring when the valve is fully open.

The smaller the total deflection of the spring is made, the higher will be the natural rate of vibration, and for that reason the total deflection is usually made considerably less than the nose-eccentricity. In that case the spring must be designed to overcome the inertia force at the point of reversal, rather than at the top of the nose.

(4) Maximum velocity is reached at the point of reversal, since this point

corresponds to the maximum value of  $\theta$  on the nose as well as the maximum value of  $\phi$  on the flank, and we can write:

$$E_{fl} \sin \phi_{\text{max}} = E_n \sin \theta_{\text{max}}.$$

From the geometry of Fig. 1-a it also follows that the distance from the point of contact between cam and follower, to the center line of the tappet is equal to

$$\frac{d}{2} = E_{fl} \sin \phi,$$

which becomes a maximum for the maximum value of  $\phi$  (point of reversal), hence represents the minimum

theoretical tappet radius in inches, and, incidentally, is equal to the maximum velocity in inches per second.

To analyze the possibilities of obtaining a high valve lift, with the limitations as to maximum acceleration, maximum deceleration and maximum velocity, we will reverse our method of computation. Instead of starting out with the expression for the lift, and by differentiation obtaining values for velocity and acceleration, we will start with the acceleration and find the expressions for velocity and lift by integration with respect to time. Representing the acceleration by  $a$ , we can write

$$V = \int a \, dt$$

$$V = \int a \, d\phi \frac{dt}{d\phi} = \frac{1}{\omega} \int a \, d\phi$$

For an angular velocity equal to one radian per second we substitute 1 for  $\omega$  and get

$$V = \int a \, dt = \int a \, d\phi$$

in other words, the time scale and the angle scale are interchangeable.

Likewise,

Cam	$E_n$	$E_{fl}$	$d/2$
I	1	3.5	0.70
II	1	3.5	0.50
III	1	1.14	0.50
IV	0.675	3.5	0.50

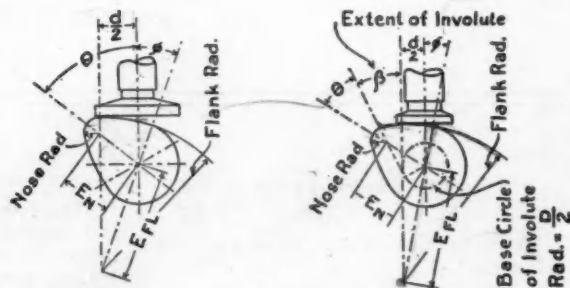
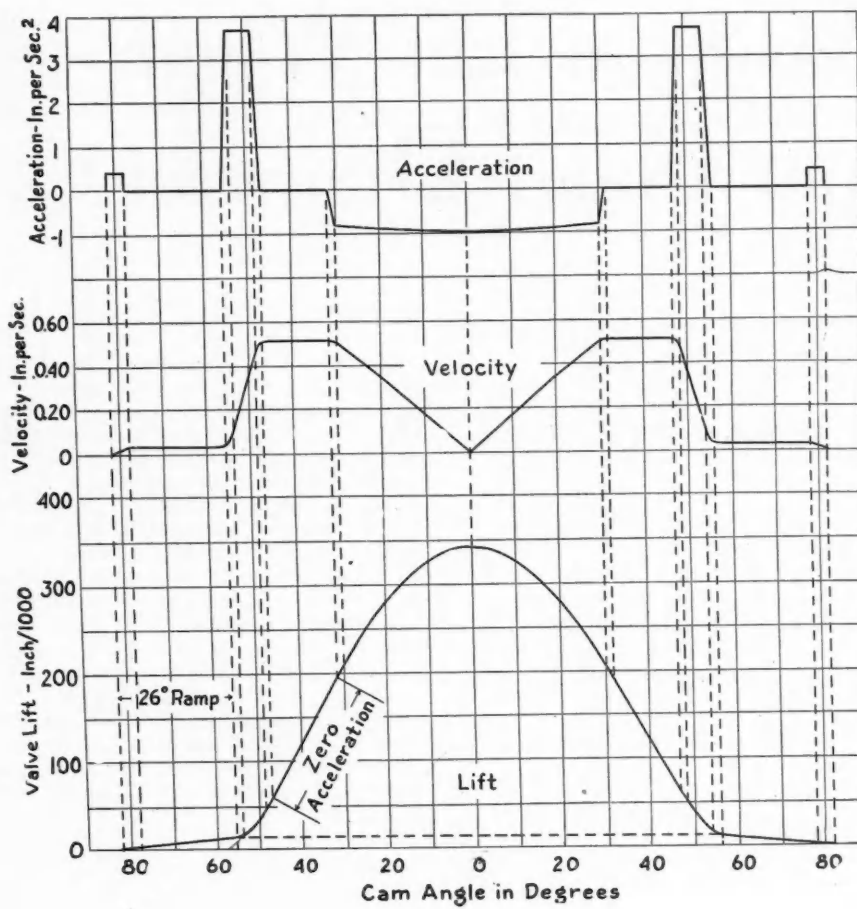


Fig. 1A—(Left) represents cams I, III, and IV, which are similar;  
Fig. 1B—(right) represents cam II



Angle	Lift	Angle	Lift	Angle	Lift
0	0.3400	28	0.2229	56	0.0120
2	0.3394	30	0.2060	58	0.0110
4	0.3376	32	0.1882	60	0.0100
6	0.3345	34	0.1703	62	0.0090
8	0.3304	36	0.1525	64	0.0080
10	0.3248	38	0.1346	66	0.0070
12	0.3181	40	0.1168	68	0.0060
14	0.3103	42	0.0990	70	0.0050
16	0.3012	44	0.0811	72	0.0040
18	0.2911	46	0.0633	74	0.0030
20	0.2797	48	0.0455	76	0.0020
22	0.2671	50	0.0306	78	0.0010
24	0.2535	52	0.0201	80	0.00025
26	0.2388	54	0.0140	82	0.00000

Fig. 2—Sample design of cam for use with flat follower of restricted diameter, the cam flank comprising an involute portion which raises the valve at constant speed

$$L = \int v dt = \int v d\phi$$

In geometrical terms, these equations mean that—

The velocity at  $\phi_1$  is equal to the area under the acceleration curve between zero and  $\phi_1$ .

The lift at  $\phi_1$  is equal to the area under the acceleration curve between zero and  $\phi_1$ .

The total lift is equal to the total area under the velocity curve.

In other words, to obtain the maximum possible lift, we must try to make the area under the velocity curve as large as possible. The maximum velocity is limited to the value of the tappet radius, which clearly indicates that there should be a period of constant velocity, which should be as long as possible.

Reverting to the expressions for the velocity on the conventional harmonic cam, we can write

$$\sin \phi = \frac{V_{fl}}{E_{fl}} \quad \text{or,}$$

$$\sin \phi_{max} = \frac{d/2}{E_{fl}} \quad (\text{on flank})$$

Likewise on the nose—

$$\sin \theta = \frac{V_n}{E_n} \quad \text{or,}$$

$$\sin \theta_{max} = \frac{d/2}{E_n} \quad (\text{on nose})$$

If the tappet radius  $d/2$ , and the flank-eccentricity  $E_{fl}$  are given, we can find the values of  $\phi_{max}$  and  $\theta_{max}$  in degrees from these equations. Subtracting these values from half the cam angle ( $= \alpha$  deg.) gives the duration of the required period of constant velocity ( $\beta$ ) in degrees. The velocity during this period is equal to  $d/2$  in inches per second, acceleration is zero, and the lift per second or per radian also is equal to  $d/2$  in inches.

$$\beta = \alpha - (\phi_{max} + \theta_{max})$$

For the total lift we can write

$$L_{total} = L_{fl} + L_n + L_{\beta}$$

$$L_{total} = E_{fl}(1 - \cos \phi_{max}) + E_n(1 - \cos \theta_{max}) + d/2 \times 0.0174533 \beta \text{ in inches,}$$

0.0174533 being the conversion factor from degrees to radians.

We will now figure out an example, and will calculate the cam shown in Fig. 1 (Cam II).

Here,

$$\alpha = 56 \text{ degrees}$$

$$E_{fl} = 3.5 \text{ in.}$$

$$E_n = 1 \text{ in.}$$

$$d/2 = 0.5 \text{ in.}$$

$$\sin \theta_{max} = \frac{d/2}{E_n} = \frac{0.5}{1} = 0.5$$

$$\theta_{max} = 30 \text{ degrees} \quad (\text{on nose})$$

$$\sin \phi_{max} = \frac{d/2}{E_{fl}} = \frac{0.5}{3.5} = 0.14286$$

$$\phi_{max} = 8^\circ 13' \quad (\text{on flank})$$

$$\beta = \alpha - (\theta_{max} + \phi_{max}) = 56^\circ - (30^\circ + 8^\circ 13')$$

$$\beta = 17^\circ 47'$$

(1) Lift on flank

$$L_{fl} = E_{fl}(1 - \cos \phi_{max})$$

$$L_{fl} = 3.5(1 - \cos 8^\circ 13')$$

$$L_{fl} = 3.5 \times 0.01025 = 0.0359 \text{ in.}$$

(2) Lift on nose.

$$L_n = E_n(1 - \cos \theta_{max})$$

$$L_n = 1(1 - \cos 30^\circ)$$

$$L_n = 1 - 0.866$$

$$L_n = 0.1340 \text{ in.}$$

(3) Lift during period of constant velocity.

$$L_{\beta} = d/2 \times \beta \times 0.0174533$$

$$L_{\beta} = 0.5 \times 17^\circ 47' \times 0.0174533$$

$$L_{\beta} = 0.1552 \text{ in.}$$

$$\text{Total Lift} = L_{fl} + L_n + L_{\beta}$$

$$= 0.0359 + 0.1340 + 0.1552$$

$$= 0.3251 \text{ in.}$$

It remains only to construct the cam profile. The nose eccentricity is taken as 1 in., and if we assume the nose radius to be 0.050 in., the base radius will be

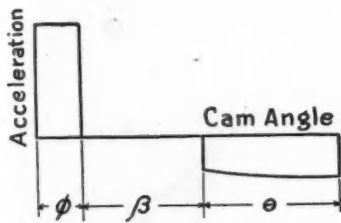


Fig. 3—Ideal acceleration diagram for cam designed for use with flat follower of restricted diameter

1.050 — total lift, or  
1.050 — 0.325 = 0.625 in.

After setting off half the cam angle (56 deg.) we draw the flank arc, which has a radius of 4.125 in. We next draw the nose arc, which extends over an angle of 30 deg. With the tappet diameter as a base circle we now draw an involute curve, starting at the end of the nose arc. This involute curve will join the flank arc at the calculated angle of 8 deg. 13 min.

This involute curve will meet the requirement of constant velocity for the tappet motion, equal in magnitude (numerically) to the tappet radius, because the normal at the point of contact between cam and follower will always be tangent to the base circle of the involute, which is made equal to the tappet diameter.

#### Comparison of Cam Characteristics

Four different cams with their resulting lift curves, velocity curves and acceleration curves are shown in Fig. 1. Assuming a maximum permissible flank eccentricity of 3.5 in. and a maximum permissible nose eccentricity of 1 in., cam I is laid out regardless of tappet diameter. The other cams are laid out for a tappet radius of 0.5 in. The diagrams clearly show the loss in lift due to a reduction in the tappet radius, as well as the improvement due to the constant-velocity period in cam II.

Cam III is laid out with the maximum permissible nose radius of 1 in. With this nose radius a flank radius of 1.4 in. is necessary in order not to exceed the maximum allowable velocity of 0.5 in. per second.

Cam IV is laid out with the maximum permissible flank radius of 3.5 in., which results in a nose radius of 0.675 in. Of the two, cam IV is the best, but it compares very unfavorably with cam II with the constant-velocity feature.

The total lift of cam IV is slightly greater than that of cam III, although the maximum velocity is the same for both. This is easily explained if we look at the velocity diagrams of the two cams. We know that the total lift is equal to the area of the velocity diagram, and although both diagrams are

triangular in shape and have the same base and the same height, their sides are not straight lines, and the areas therefore differ.

It will be obvious that the smaller we can make the angles  $\phi_{max}$  and  $\theta_{max}$ , the larger the angle  $\beta$  and the higher the resulting total lift will be. To make the angles  $\phi_{max}$  and  $\theta_{max}$  small, we should make both acceleration and deceleration as high as is practically possible.

The maximum acceleration is limited by the allowable maximum tappet load; the maximum deceleration is equal to the nose radius and therefore limited to half the camshaft bearing diameter minus the nose radius. To avoid manufacturing difficulties we should not go too far with reducing the nose radius; 0.050 in. can be set down as a reasonable minimum.

For that reason, a change in contour of the nose, so as to obtain constant deceleration, with the object of reducing the duration of deceleration while giving the same maximum velocity, would not give the desired results. The limit of 0.050 in. radius of curvature set for the profile of the nose, means that we cannot increase the deceleration at

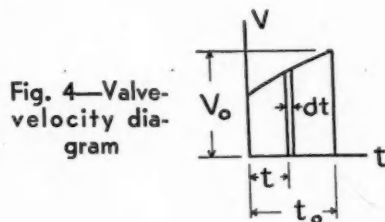


Fig. 4—Valve-velocity diagram

the point of  $\theta_{max}$  above the deceleration obtained with the circular-arc-nose cam.

On the flank, however, we have no such limitations, and even though the gain in total lift is small, there does not appear to be any objection to changing the contour so as to obtain constant acceleration. An added advantage can be found in the simple expressions for the velocity and for the lift, which become:

$$\text{Velocity} = at = a\theta$$

$$\text{Lift} = 1/2 a t^2 = 1/2 a \theta^2 \quad (\theta \text{ in radians})$$

$$\text{or Velocity} = 0.0174533 a \theta$$

$$\text{Lift} = 0.0174533^2 \times 1/2 a \theta^2 \quad (\theta \text{ in deg.})$$

Fig. 3 shows this ideal acceleration diagram, which consists of three distinct periods.

- (1) Period of constant acceleration.
- (2) Period of zero acceleration.
- (3) Period of deceleration according to the expression

$$\text{Dec.} = E_n \cos \theta$$

The maximum value for  $\theta$  can easily be found, and the rest of the computa-

tion is identical with that given for the cam with circular-arc flank. Construction of the actual cam profile for constant acceleration is rather difficult, but is not necessary. All we are really interested in is the lift curve and a tabulation of the lift per degree rotation, which is all that is necessary to make the master cam.

#### Quieting Curve or "Ramp"

So far, the question of the quieting curve or "ramp" has been neglected in the analysis. The ramp represents a period of low, constant velocity and zero acceleration, and to reach this velocity, should be preceded by a period of acceleration—preferably of constant acceleration—of short duration. This means, of course, that the cam profile for this period of constant velocity follows an involute curve, while the radius of the base circle of this involute in inches is equal to the velocity on the ramp in inches per second, for an angular velocity of one radian per second ( $30/\pi$  r.p.m.). To avoid a change in tappet velocity when leaving the ramp and beginning contact with the flank, the ramp should join the flank at that point where the velocity on the flank equals the ramp velocity.

The lift for the motion on the ramp over the first period of constant acceleration follows a parabolic curve. If the velocity at the end of this period is 0.0005 in. per deg., the duration of this period four degrees, then:

Lift first degree = 0.0000625 in.  
second degree = 0.000250 in.  
third degree = 0.000625 in.  
fourth degree = 0.001000 in.

From there on, up to the point where the ramp ends, a rate of lift of 0.0005 in. per deg. should be maintained.

We have seen that the area under the acceleration curve must equal the area under the deceleration curve. Addition of a ramp means, of course, an additional area of acceleration diagram for the period of constant acceleration preceding the ramp, hence requires a reduction by the same amount of the area of the acceleration diagram for the flank. This is automatically taken care of if the ramp involute joins the flank arc at the point of equal velocity, as

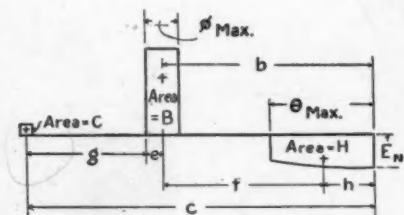


Fig. 5—Diagram serving to demonstrate that the lift is equal to the static moment of the acceleration diagram



mentioned above. The location of this point can be easily found.

The expression for the velocity on the flank is:

$$V_{f1} = E_{f1} \sin \phi$$

Substituting for  $V_{f1}$  the ramp velocity will give the solution for  $\phi$ .

For a ramp velocity of 0.0005 in. per deg. or  $0.0005 \times 0.0174533$  in. per radian, and  $E_{f1}$  equal to 3.5 in., the angle  $\phi$  is equal to 27 min. For the constant-acceleration-flank cam this angle will be slightly different, of course. The expression for the velocity is  $V = a \phi$ , and this can be solved for  $\phi$ .

In the computation the ramp should be taken care of right from the start, rather than later on. If the tappet radius and, therefore, the maximum velocity is given, we subtract from this value the ramp velocity (in inches per radian) and use this figure as the required area of the acceleration diagram of the flank.

*Lift equals static moment of acceleration diagram*

We have seen that the velocity is equal to the area of the acceleration diagram, and that the lift is equal to the area of the velocity diagram, and will now prove that the lift is also

equal to the static moment of the acceleration diagram. This makes it possible to compute the lift at any point of the cycle directly from any arbitrary acceleration diagram.

Computation of the lift curve is particularly simple if the acceleration diagram is of such a shape that the center of gravity as well as the area can be easily found. Referring to Fig. 4,

$$L_{t_0} = \int_0^{t_0} v dt$$

$$= v_0 t_0 - \int_0^{t_0} t dv$$

$$a = \frac{dv}{dt},$$

so

$$L_{t_0} = v_0 t_0 - \int_0^{t_0} a t dt$$

$$= t_0 \int_0^{t_0} a dt - \int_0^{t_0} a t dt$$

$$= \int_0^{t_0} a dt (t_0 - t)$$

= Static Moment

This means that the lift at  $t_0$  is equal to the static moment with respect to  $t_0$ , or equal to the area of the acceleration

diagram times the distance of the center of gravity from  $t_0$ .

For Fig. 5 we can write:

$$\begin{aligned} \text{Total lift} &= bB + cC \bar{\phi} hH \quad \text{or,} \\ &= b(H-C) + cC - hH \\ &= (b-h)H + (c-b)C \\ &= fH + (g+e)C \\ &= f \times \text{tappet radius} \\ &\quad + (g+e) \times \text{ramp velocity.} \end{aligned}$$

It will be clear that the lift at any point of the lift curve can be found in a similar manner. For a circular-arc-nose cam, the value of  $h$  in Fig. 5 can be easily calculated, since

$$F_n = E_n(1 - \cos \theta_{max})$$

and

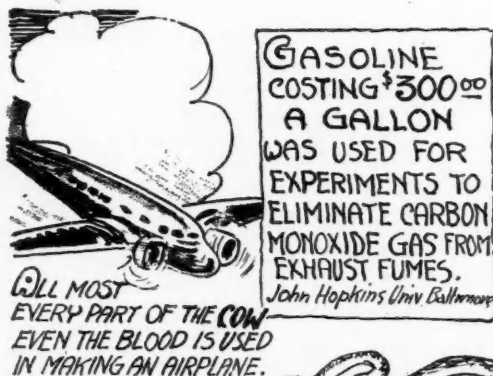
$$F_n = H(\theta_{max} - h)$$

Knowing that  $H$  is equal to the maximum velocity and equal to the tappet radius, we can solve for  $h$ .

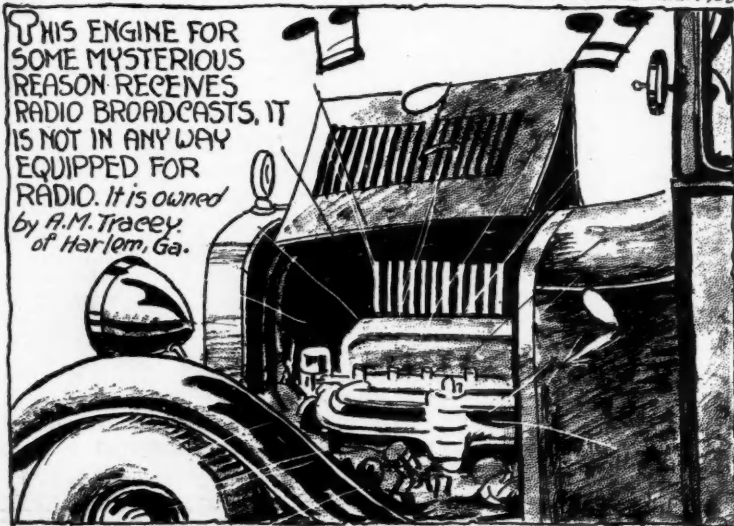
The lift curve of Fig. 2 was calculated by this method, and the results were tabulated. To avoid a sudden application of inertia load, the acceleration in Fig. 2 is shown starting with zero but rising to its maximum value rapidly.

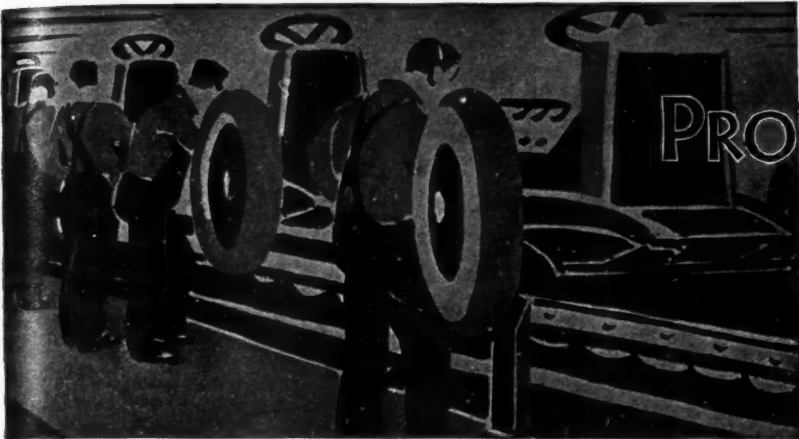
Although it may be of little practical value, it is interesting to note that the area of the lift diagram is also equal to the moment of inertia of the acceleration diagram.

## Automotive Oddities—By Pete Keenan



**THIS ENGINE FOR SOME MYSTERIOUS REASON RECEIVES RADIO BROADCASTS. IT IS NOT IN ANY WAY EQUIPPED FOR RADIO. It is owned by A.M. Tracey of Harlem, Ga.**





## PRODUCTION LINES

### Sheds Light

Down in Virginia, Professor Norton has developed and tested one of the best techniques in current literature on economic lot sizes. The method is brilliant in its simplicity and practicality. On the practical side the Norton theorem starts with the proposition that the economic lot size is of value only insofar as it shows what the economic lot size is numerically. Then the author demonstrates by means of a simple tabular method that in most cases nothing is lost by using certain values of lot size above or below this theoretical value. And he recommends a value smaller than the theoretical since the smaller value increases the rate of turnover, decreases the investment, and decreases the hazard of loss through obsolescence. Applying the principle in a Virginia enterprise, the author was able to effect a reduction of \$6,000,000 in capital investment in one year. Incidentally, one of the elements of his formula, there is a formula but you don't have to use it, is a return on invested capital equal to anticipated earnings rather than the customary 6 per cent interest rate. Unfortunately for an editor the story is so well written and so succinct as to defy any effort at abstracting. So we refer you to "Economic Lot Sizes in Manufacturing" by Paul T. Norton, Jr., Bull. Virginia Polytechnic Inst. for April 1, 1934.

### Frameless Trucks

Who is going to start the ball arollin' with a frameless truck design? Just a while back we saw the original drawing of such a job in the drafting room of a prominent bus builder but don't imagine that it will be released. So far the frameless

design has been considered only for oil tanks where the tank structure can provide the necessary backbone. How far this idea may be carried into the field of other types of commercial bodies is a matter for conjecture.

### New Styles

For an outside engineering appraisal of the current trend in passenger car design, even though it be somewhat academic, we recommend a reading of an article by Dean A. Fales of M. I. T. It's entitled, "Comment on the New Passenger Cars," published in The Tech Engineering News for June. Dean Fales has made an analysis of a number of small details that really loom big so far as the car buyer is concerned. Read it if even you can't agree with it all.

### Rubber Putty

"Plastikon" putty, a compound similar to putty except that it is combined with rubber, has been developed by B. F. Goodrich. It requires no mixing, being practically oil-free. Said to resist corrosion of chemicals and fumes as well as the action of water. Another virtue is a high degree of adherence to steel surfaces.

### Ocular Proof

Reo, as you probably know, has one of the finest inspection laboratories in the industry, featuring a number of Zeiss optical machines. What interested us was the plus service they get out of it. For one thing, it's a fine place to take visitors and Reo owners are duly impressed with the machine that measures the deflection of a 4-in. steel bar when bent by the pressure of the hand. In the factory

Zeiss equipment is the final judge of conformity to specified tolerances. By far the most impressive by-product of the laboratory comes in dealings with suppliers. Its findings are final. If the Zeiss machine rejects a tool or anything else the supplier takes it and likes it. Which is something to shout about on both sides.

### Cuts Leaks

By placing the ignition coils on top of the engine alongside the distributor, Packard has practically eliminated radio interference from the ignition system. Through moving the coils from the usual location on the dash or instrument panel to the engine itself. Packard reduced the length of the high tension wire from 18 to 5 inches and practically eliminated the losses in electric current. At the same time the change resulted in a marked improvement in ignition and added greatly to the life of spark plugs.

### By Storm

Open house for small boys during opening week at the Chicago Fair caused no end of trouble for exhibitors. You may have heard that the Fair officials out of the kindness of their hearts as well as to bolster attendance figures let Chicago youth into the grounds for the price of a movie. The youngsters enjoyed it thoroughly and being souvenir hunters at heart proceeded to tear the place apart. One automobile exhibit had to replace every loose part such as bulb, ornament, gear shift ball, etc., when the shouting was over. In addition, the youngsters' visit gave employment to many painters and decorators.

—J. G.



# New Representation by the Employees of N

## ARTICLE I.

### The Name of the Organization

The name of the organization (herein referred to as "Association") shall be FISHER BODY EMPLOYEES' PROTECTIVE ASSOCIATION, PLANT NUMBER ONE OF FLINT, MICHIGAN.

## ARTICLE II.

### Purpose of Association

The purpose of this Association shall be to provide means and measures whereby the employees of the Fisher Body Plant Number One of Flint, Michigan (herein referred to as "Company") and the Company may more closely cooperate in all matters affecting their mutual relations, including, among other things, negotiations and collective bargaining as to wages, hours of work, safety, sanitation and other working conditions, social recreation and athletics, promotion of health and all other matters pertaining to the interest of such employees, and to further provide an orderly and expeditious procedure for the prevention and adjustment of all differences.

This Association will also render welfare assistance to its members when they are in need, and it will also assist various members of this Association in their endeavors to secure naturalization papers.

## ARTICLE III.

### Membership

Any person employed by the Company for a period of fifteen (15) days or more who is not a major or a minor executive thereof, nor anyone who has the authority to employ, discharge or discipline other employees, is eligible to membership in the Association, regardless of race, creed, sex, or membership in any other lawful organization, and any such employee shall become a member of the Association im-

mediately upon filling out and signing an application and filing same with the secretary thereof, for membership in such form as may be adopted by the Employees' Council for such purpose. Membership in the Association shall be entirely voluntary. All employees, with the exception heretofore stated, are eligible for membership in said Association as soon as their employment with the Company continues for a period of fifteen (15) days, and such membership shall not terminate until such member or members sever his or their connection as employee or employees of the Company. Upon the employee severing his or her connection with the Company, such severance shall automatically terminate said membership thirty (30) days after date of severance of employment. However, in the case of a temporary lay-off or leave of absence, such shall not terminate said employee's membership in the Association, unless and until such lay-off or leave of absence extends for a period of six (6) calendar months, and during such period said member shall be deemed a member in the voting group where he last worked.

Every member of the Association shall have the following rights:

(a) To vote in the election of employees' representatives of the Council, as provided in Article IV hereof.

(b) To be eligible for election, or reelection as an employees' representative upon the Council, subject to the qualifications set forth in Article IV hereof.

(c) To make suggestions and complaints to the member or members of the Employees' Council elected from his voting division, with reference to wages, hours, or labor, working conditions or any other appropriate subject while actually engaged in his employment at the said Company, and said employee shall not because of said interview with the member of the Employees' Council be subjected to coercion, influence, threats or duress by any executive officer, or other employee of said Company.

## ARTICLE IV.

### Employees' Council

1

### REPRESENTATION OF MEMBERS OF EMPLOYEES' COUNCIL

The purposes of the Association shall be accomplished through the Employees' Council hereinafter referred to, and each member of the Association hereby vests in said Council the power and authority to represent such member in all his or her dealings with the Company and its management, as to the matters, referred to in Article II hereof. Every member of the Employees' Council shall be free to dis-

SIX months of experience with employee representation plans have brought about many changes in their set-up. Most important probably is that management, control and organization methods are now in many cases entirely in the hands of the workers.

G.M. was a leader in the automotive industry in pioneering "cooperative bargaining at no cost." As in the case of any pioneering work a number of faults can be found in retrospect with the original set-ups, standardized for virtually all G.M. plants.

In the past few weeks employee organizations in many of these plants have re-organized. With constitutions and by-laws worked out by the employees themselves there are obviously wide divergencies in organization and representation methods from plant to plant. The accompanying constitution of employees in the Fisher No. 1 plant in Flint is given largely as a sample, and because so many of the "outside labor union" inspired labor troubles in the industry centered around this plant.

Those who are acquainted with employee representation plans will find many changes, many of these duplicated in other similar new organizations. Many others are not. For instance the Fisher employees specify that their representatives must be employed in the voting division from which they are elected, and must have been with the company at least one year. Another organization, at Cadillac Motor Car Company for instance, is more liberal in this respect. It carries neither of these provisions although it is assumed that any voting district would select its representative from among its group in order to be sure that such a representative would have the most intimate knowledge of conditions and problems in the specific voting district.



# Plan Formulated and Adopted

## No. 1 Fisher Plant in Flint

charge his duties in a wholly independent manner without fear that his individual relations with the Company will, in any manner, be affected by any action taken by him in his representative capacity. Any member of the Employees' Council shall have the privilege of taking the question of any alleged personal discrimination against him by reason of acts in his representative capacity, to the Employees' Council first, then to any qualified executive of the Company, then to any executive of the Fisher Body Division at Detroit, Michigan, and finally to the duly constituted Labor Board or tribunal now or hereafter in existence, having jurisdiction to determine such disputes.

### 2

#### INITIAL EMPLOYEES' COUNCIL

The initial members of the Employees' Council shall be the following named individuals, who shall serve until their successors are elected, as hereinafter provided:

Alfred W. Anderson, Chairman; Charles Wilson, Louis Zettel, Louis Stephen, Wilfred Houle, William Johnson, Harry Miller, Samuel Caldwell, John Johnson, A. W. Murphy, Joseph Goodman, Henry Anderson.

### 3

#### QUALIFICATIONS OF FUTURE MEMBERS OF THE EMPLOYEES' COUNCIL

All members of the Employees' Council, who are hereafter elected, shall at the time of their nomination and election—

(a)—be employed in the voting division from which they are nominated and elected.

(b)—be over twenty-one (21) years of age; and

(c)—have had not less than one year's employment with the Company.

### 4

#### Number of Members of Council

For the purpose of future elections of members of the Employees' Council from the various departments, each of the following divisions of employees, or such divisions as shall hereafter be so formed, shall, for all purposes, be deemed a separate voting division:

(a) Body in White Department—Two (2) Representatives. One (1) Representative to be selected from the Metal Division; and one (1) Representative from the Wood Division.

(b) Paint Department—Two (2) Representatives.

(c) Final Assembly Department—One (1) Representative.

(d) Trim Department—Two (2) Representatives. One (1) Representative from the cutting, sewing and cushion division; and one (1) Representative from the Trim Division.

(e) Mill Department—Two (2) Representatives. One (1) Representative from the Rough Division (including yard); and one (1) Representative from the Finish Division (including Glue Division).

(f) Press-room and Metal Department—Two (2) Representatives. One (1) Representative from the Metal Shop; and one (1) Representative from the Press-room.

(g) General Plant—Two (2) Representatives. One (1) Representative from the lay-out inspection and tool and die division; and one (1) Representative from the Maintenance Division (including janitors, watchmen, power house employees, Shipping, Salvage, Receiving, Stores Division).

(h) Clerical Division—One (1) Representative. This Division includes all office help, clerks, and time checkers.

In all future elections of members of the Employees' Council, each voting division shall be entitled to elect at least one

member of the Employees' Council. Whenever reference is made herein to the representative of a member of the association, such shall be deemed to mean the member or members of the Employees' Council elected from the voting division in which such member or members of the association are employed.

### 5

#### Balloting

Nominations and elections of members of the Employees' Council shall be by secret ballot. The balloting shall be conducted in such a manner that all members of the Association shall have an opportunity to vote without influence or interference of any kind. The polls shall be open throughout each nomination and election day (twenty-four hours).

The Employees' Council shall annually appoint a Chairman of Election for each voting division, which Chairman shall have charge of all elections held in his division during the term of his appointment. The Election Chairman in each division shall appoint three (3) tellers, who shall be members of the Association employed in said division, and whose duty it shall be to count the ballots in their respective divisions. It shall be the duty of the Chairman to select as tellers only members of unquestioned honesty and integrity.

The Employees' Council may, from time to time, make such other rules and regulations covering the conduct of nominations and elections and the balloting therein as it may deem desirable.

### 6

#### Eligibility for Voting

Each member of the Association shall be entitled to vote in the nomination and election of the member or members of the Employees' Council who are to be chosen from his voting division.

### 7

#### Nominations

Nominations shall be held on the Second (2nd) Tuesday of January in each year, beginning with the year 1935. On or before the day of nomination, each qualified voter shall be furnished a ballot stating the number of persons for whom he is entitled to vote, and shall also be furnished a list of the members of the Association

in his voting division who are eligible for nomination. Such voter shall write on his ballot the names of the persons whom he desires to nominate as candidates for election as members of the Employees' Council. Each member of the Association shall be entitled to vote for four nominees for each Representative to be elected from his voting division. Those members of the Association, to be elected from the voting division in question, who receive the largest number of votes shall be declared nominated and shall have their names entered on the official ballot for voting in such division.

If, on any nomination ballot, the name of the same person shall appear more than once, such ballot shall be counted as a single vote for such person. In case the number of persons whose names appear on any nominating ballot or the number of persons voted for on any election ballot shall exceed the designated number, as stated on the ballot, such ballot shall be void. In the event the department or division in said department of the Company is not operating on the date designated for a nomination or election, the next succeeding full business day shall be substituted.

### 8

#### Elections

Elections shall be held annually on the first Tuesday immediately following the annual nomination. Over fifty per cent of the membership shall constitute a quorum. On the day of election each member of the Association shall be furnished a ballot on which the names of the candidates nominated from his voting division shall be printed in the order of the number of votes received by each at the nomination, and such ballot shall state the number of persons for which such member is entitled to vote. Each voter shall indicate his preference by placing an "X" opposite the name or names of the candidate or candidates of his or her choice, up to the number of representatives to be chosen from his or her voting division. The candidate or candidates receiving the highest number of votes (in accordance with the number to be elected) shall be declared elected as the representative or representatives of the members of the Association who are employed in the particular voting division in question, and shall take office at the time of the first regular meeting following the annual election. Notification of election shall be given to the successful candidates, and to the members of the Association in such manner as the Employees' Council may determine.

If a member of the Employees' Council shall die, or be recalled or cease to be eligible for membership in the Association, as provided in Article III hereof, or shall permanently transfer from one voting division to another, his term of office shall automatically terminate. Candidates failing of election in any voting division shall stand as alternates of the successful candidates from such voting division in the order of the number of votes received, and automatically become representatives of such voting division as may arise from vacancies. In the event of a vacancy for which there should be no alternate as above described, who is willing to serve, the Employees' Council shall choose a representative to fill such vacancy; provided that each representative so chosen shall be a member of the Association employed in the voting division which elected the representative whom he succeeds. Any representative filling a vacancy shall serve until the next annual election. In the event a tie shall occur in any nomination or election, seniority in the Company's employment shall determine the choice. In the event of any controversy arising, concerning any nomination or election, it shall

### Do Employee Representation Plans Work?

In an early issue *Automotive Industries* will present a summary of an investigation of bargaining activities in a group of employee associations — what they have accomplished and where they have failed. Watch for it.

be referred to and decided by the Employees' Council.

However, in the event that the management of said Company transfers a member of the Employees' Council from one voting division to another, contrary to his wishes, and if said member of the Employees' Council feels that he is being discriminated against, he may file an oral or written complaint in accordance with the provision of Article IV, Section 1, in order to protect his membership in said Council and be granted a hearing thereon.

If any member of the Employees' Council is unable to satisfactorily discharge his duties for the Company because of the type of work that he or she is engaged in, he may request the Company to transfer him or her to some other type of work in the Division that he is then employed in. Said transfer is to be effective only during his term of office as a member of the Employees' Council; upon the expiration of his or her term, said employee, who has been a member of the Employees' Council, is to be returned to his or her original employment, that is, the employment that he or she were engaged in at the time that they were elected a member of the Employees' Council, or the work that he or she were engaged in at the time that a transfer was requested by said member of the Employees' Council. If a transfer of this nature should occur, said member of the Employees' Council shall be transferred to a job paying an equal or greater wage than he or she is obtaining on the work that they were engaged in at the time of the request for said transfer.

#### 9

##### Term and Removal

The above named initial member of the Employees' Council shall hold office until their successors are chosen at the election to be held in January, 1935. Each member of the Employees' Council hereafter elected shall hold office for one (1) year from the date of his election or until his successor is elected, as heretofore provided, and is eligible to succeed himself. A representative may be recalled before the end of his term upon the voting of a majority of the other members of the Employees' Council, pursuant to the filing of a petition for such recall, signed by two-thirds of the eligible voters of his voting division.

#### 10

##### Time and Place of Meetings

Regular meetings of the Employees' Council shall be held on the first Monday of each month, and special meetings may be held at any time upon call by the Chairman of the Employees' Council. The said Chairman shall call a special meeting whenever requested by one or more representatives. Special meetings shall not

be held more than once in each week, except in emergencies.

Executives or representatives of the Company or its management shall not be present at any meeting of the Employees' Council, except when requested by the Council or its Chairman.

The place of the meetings of the Employees' Council shall be established thereby. A majority of the members of such Council shall be a quorum thereof, necessary to transact any business. Except as otherwise provided, the Employees' Council shall act in all matters by the vote of the majority of the members of the Council present at any meeting.

The Employees' Council may establish such other rules and regulations in connection with the holding of its meetings, recording of minutes and transactions thereof as it may deem proper.

#### ARTICLE V

##### Officers

At the first regular meeting following the annual election, a Chairman, a Vice-Chairman, a Secretary and a Treasurer shall be elected from among the members of the Employees' Council, each to serve for the ensuing year, or until his successor is elected. The Chairman and in his absence, the Vice-Chairman, shall preside at all meetings of the Employees' Council. The Secretary shall keep all books and records of the Council. The Treasurer shall be the custodian of all funds that may come into the possession of the Association, and shall receive for his services as Treasurer, One Dollar per year, and shall, at the option of the Council or a majority thereof, execute a surety bond running in favor of the Association, the premium thereof to be paid out of the moneys or funds of the Association.

The Employees' Council may elect such other Officers or Committees and select such Agents, and assign thereto such duties and confer thereupon such powers as it may from time to time deem proper.

#### ARTICLE VI

##### Procedure for Handling Suggestions and Complaints of Members

Each suggestion or complaint shall define the issues and provide a means of recording and following the same to a conclusion, and shall consist of a memorandum by a member of the Association, which may be submitted in writing, but need not be signed by the member in question.

Every suggestion or complaint shall be taken up by the member in question with his representative in the Employees' Council or with his foreman in an endeavor to settle and dispose of any such suggestion or complaint. Each member of the Employees' Council shall have the free, un-

prejudiced, and unrestrained right to confer thereupon, first with the foreman involved, next with the superintendent concerned, or with the Manager of the Plant.

In the event, however, a member of the Employees' Council cannot reach an agreement upon any complaint or suggestion with the available officers of the Company, such matters shall be referred to the Employees' Council and considered thereby at its next meeting. The Employees' Council may then investigate the matter, and if necessary, take up the matter with the Plant Manager. In the event the Employees' Council and the management of the Company cannot reach a satisfactory agreement on any matter so presented, the same may be taken up by the Employees' Council, or its duly appointed representatives, with the Executives of Fisher Body Division at Detroit, Michigan, and if no satisfactory agreement can then be reached, finally with the duly constituted Labor Board or tribunal now or hereafter in existence, having jurisdiction to determine such disputes.

The Plant Manager or his representative shall not be present at the Employees' Council meetings, except when requested by the Employees' Council.

The Employees' Council shall have the responsibility and authority to handle any suggestions from any employee or group of employees and may make their recommendations to the Plant Manager after due investigation. The Employees' Council will be recognized by the Company as authorized representatives of the employees when they are holding office.

An employee may make a complaint direct to the Employees' Council or to the Employees' Council through his Employee Representative.

All meetings of the Employees' Council shall be private. The Council may demand the attendance of any employee whose evidence is desired.

Members of the Employees' Council shall be granted leave of absence from his or her work at all times, either to attend regular or special meetings of the Council and to investigate complaints or grievances. However, he or she shall notify his or her respective foreman or superintendent of his or her intention of leaving his or her work.

#### ARTICLE VII

##### Amendments

This Constitution may be amended at any time and in any particular, either (1) by the affirmative vote of all the members of the Employees' Council, or (2) by the affirmative vote of fifty per cent of the membership eligible to cast ballots in an election called and held for the purpose of voting upon such amendment. Any such election shall be held in accordance with the method of balloting, provided in Article IV (5) as heretofore provided.

## Graphited Oil as a Lubricant for Ball Bearings

TESTS on an S.K.F. double-row self-aligning ball bearing lubricated with graphited oil supplied by E. G. Acheson, Ltd., British associates of the Acheson Oildag Co., were made at the National Physical Laboratory of England, and a report on the tests was issued. The ball bearing had a bore of 2½ in., an outside diameter of 5½ in., and an axial width of 1¼ in., and it contained 34½-in. balls. Mounted in a journal-friction testing machine, the bearing was loaded with 3600 lb. and run at 1300 r.p.m. for a continuous period of 100 hr. This is the load given for the particular speed in the maker's catalogue, and is said to be suitable for a life of 200 hr., so that the test may be regarded as cov-

ering the first half of the life of the bearing. Following are extracts from the report on the test.

The coefficient of friction varied from 0.0009 at 37.5 to 39.5 deg. C. to 0.00085 at 40-42 deg. C. The variation evidently was due to changes in the temperature of the oil, and there was no change of friction due to the time of running.

Pantograph traces of the races before and after test were identical, and there was therefore no local wear of the order of  $2 \times 10^{-4}$  in. (this being the limit of sensitivity of the apparatus). The inner race was examined before and after the run, and no cracks could be found.

There was no difference between the weights of the balls and outer

race before and after the test. The inner race showed a loss of weight of 0.145 gram, but this did not occur on the working surface, since it would then have been evident on the pantograph trace. An examination showed that the end face had been scored where it had rotated against the fixed collar when being tightened up, and also that contact corrosion had taken place between the shaft and the bore of the inner race. This had caused the shaft and race to adhere so that it was necessary to force the latter off and the usual red powder formed by contact corrosion of this nature was lost before the part was weighed.

These observations show no appreciable wear of the running parts.



# BOOK REVIEWS

## The Engine Indicator

The Engine Indicator, Its Design, Theory, and Special Applications, by K. J. DeJuhasz. Published by Instruments Publishing Co., New York.

In view of the large amount of development work done on engine indicators during the past decade and the numerous new types evolved, a book on the subject is particularly timely. Moreover, Professor DeJuhasz is unusually well qualified to undertake the preparation of a volume on the subject. In 1922 he submitted to the Technical University of Budapest a thesis on "A New Method of Investigating Periodically Recurring Rapid Pressure Phenomena"; he has acted as chief engineer for a well-known firm of indicator manufacturers, and he has developed an indicator of his own, of the interrupter-valve type; in fact, the engine indicator seems to have been his major interest ever since graduation.

The book under review starts with an account of the early history of the steam engine indicator, ends with an Analytical Theory of the Indicator, and in between gives profusely illustrated descriptions of a large number of instruments that have reached the practical stage. It certainly contains a great mass of information on indicators and should meet the requirements of any one in need of such information.

## Automobile Electrical Equipment

Automobile Electrical Equipment, by A. P. Young and L. Griffiths. Published by Hiffe & Sons, Dorset House, Stamford Street, London S. E. 1.

The term "automobile" in the title of this book is to be taken in its widest sense, for the authors deal with the electrical equipment not only of motor cars but also of airplanes and motor boats. One of the authors, Mr. Young, was prominently connected with the development of the magneto industry in Great Britain and about a decade ago issued a book on that subject which went very thoroughly into the details of magneto design. This book appeared in

two successive editions, and when the second edition was exhausted it was deemed advisable to expand the scope of the work to cover the whole field of electrical equipment rather than to issue a new edition devoted to magnetos only.

In the first chapter the fundamental principles of electrical phenomena are explained, and in the second the authors pass on to an outline of the complete electrical equipment, the various elements of the equipment being briefly described. Succeeding chapters deal with the principal elements of the equipment in detail. The treatment is thoroughly practical and the book can be recommended to those looking for a thorough, up-to-date treatise on electrical equipment. It contains 336 pages (8¾ x 5½), with more than 300 illustrations and sells at 15/6.

## Diesel Research

Forschungsheft 363 (Research Publication No. 363), published by V. D. I. Verlag, Berlin NW 7, Germany.

This research publication contains two reports or papers, one by Dr. Arnold Langen of Cologne-Deutz, on "The Diesel Locomotive with Direct Drive," the other by Dr.-Ing. W. Lindner, on "The Scavenging Process in Two-Stroke Engines" (in German).

In the first paper the development work on Diesel locomotives carried on at the Humboldt-Deutz Motor Company over a period of several years is described in some detail. It began with a gear-drive locomotive having a conventional vertical engine combined with friction clutch and sliding change gear, finally led to a locomotive in which there are three horizontal two-stroke, double-acting cylinders whose pistons are direct connected to the two driving axles by the same mechanism as used in steam locomotives. The paper shows photographs and line drawings of the various experimental locomotives, and gives some test results.

The second paper is based on experiments on flat models of a two-stroke cylinder having both the

scavenging port and the exhaust port at the lower end, thus giving what is known as transverse scavenging, instead of uniflow scavenging. The scavenging port was given a number of different forms, all more or less inclined upwardly. Test methods are described and the results discussed. It was found that for a cylinder with inlet and outlet ports on opposite sides, a more perfect scavenging effect is obtained if the scavenging air is admitted to the cylinder in an upward direction, as this reduces the vortex space in the upper part of the cylinder which is not affected by the scavenging flow.

## Common Sense On Common Stock

"Common Sense on Common Stock," a guide book for average investors by I. Edwin Tannebaum and Linhart Stearns, veteran observers of the stock market, has just been released by Covici and Friede. In the beginning the book has one weakness, it presupposes a certain knowledge of common stocks, what they are and what they represent in the financial and investment fields. Greater value would have been given the work had it contained in the opening paragraphs a clear-cut definition of the common stock as compared with preferred issues and the distinction between stocks and bonds.

## History of the Motor Car

A copy has been received of a 28-page book entitled Gottlieb Daimler in der Geschichte des Kraftwagens (Gottlieb Daimler in the History of the Motor Car) by Conrad Mattschoss, which has been published by the Verein Deutscher Ingenieure, Berlin, NW7, on the occasion of the centenary of Daimler's birth (March 17). The booklet gives a very readable history of Daimler's part in the development of the motor road vehicle. Daimler's first high-speed gasoline engine (1883) and most of his earlier vehicles are illustrated.



# The Forum

## Streamlining the Front of the "Milk-Wagon"

Editor, AUTOMOTIVE INDUSTRIES:

Of recent years the automobile people have become conscious of the advantages of reducing the air resistance. However, during the past few years streamlining has been applied to the front end of cars only. All aeronautical engineers are aware of the importance of proper rear-end streamlines and are inclined to belittle the efforts of the automobile people; they forget that they themselves have been cleaning up airplanes and not "milk wagons," as the car of yesterday has been so aptly described. It was my good fortune to have the opportunity to make certain tests at Ohio State University which are closely related to this subject. These tests, although of a very elementary nature, are, nevertheless, basic.

To illustrate to students of automotive engineering the problems of smooth airflow, a series of six models were tested in the 3-ft. wind tunnel. As shown in Fig. 1, they were ar-

ranged to form a series, starting with A, a simple block with rectangular sides measuring 5 by 5 by 7 in. To this were added suitable front and rear ends. With all except the last of the series, the shaping was done in one plane only, the other view remaining a simple rectangle. Model F was shaped in both side and top view, but was otherwise of the same form as E.

These models were tested for wind resistance at speeds of from 35 to 55 m.p.h. In Fig. 2 the resisting forces are plotted on a base scale proportional to the square of the speed. Note the reduction in resistance caused by the additions. Line B is only slightly lower than line A, and C is somewhat lower yet. However, there are no such remarkable gains as one is led to believe should result. With the addition of a well-shaped front, there is a considerable gain, even though the rear is square. With the front well shaped, the rear streamlining now becomes effective



















and lines E and F are well known.

During these tests the students followed the flow about the models with a small woolen yarn at the end of a wire. Fig. 3 represents the type of flow found about model C, and of itself explains why there can be no real streamlining until the front has been properly shaped. The flow "splashing" off the front clears the sides widely, and energy-consuming eddies are formed which continue well past the tail. The "streamer" would whirl violently, and close to the side surfaces would point forward.

Model F shows that still further gains are to be had if the streamlining is done in both top and side views. The influence of the ground, of course, introduces a handicap.

We may therefore conclude that streamlining the front of a "milk wagon" is not "dressmaking," but does greatly reduce the resistance. Furthermore, unless the front is first properly shaped, there can be but little gained at the rear. The resistance coefficients are included in Fig. 1 in the two usual forms, as are the drags in per cent of the drag of the rectangular block A.

By front streamlining alone the

MODEL NO.	SHAPES OF MODELS			COEF. ENG.	COEF. ABS.	% "A"
A				.00230	.902	100
B				.00225	.882	98
C				.00195	.765	85
D				.00092	.361	40
E				.00065	.255	28
F				.00019	.075	8

(NOTE—WIND FROM LEFT.)

Fig. 1—Shapes of Models—Coefficients

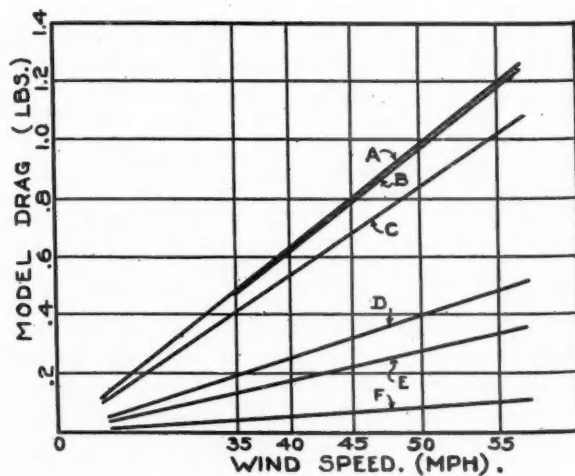
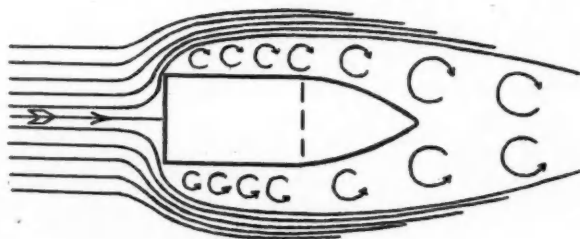


Fig. 2—Drag of Models

Fig. 3—Airflow lines with Model C



resistance coefficient may be reduced to as low as 40 per cent of that of the rectangular block, and with the addition of rear streamlining the coefficient may be reduced to 8 per cent. The balance between efficiency and

utility will govern the amount of rear streamlining that the buying public wants, but there is no excuse for poor shapes at the front and it most certainly is not "dressmaking."

A. J. FAIRBANKS.

## No Torque Change Without Reaction on Chassis

Editor AUTOMOTIVE INDUSTRIES:

In an article recently published in *Automotive Industries* the author states that it is possible to get transmission torque change without a reaction member fixed to the frame.

To every one interested in and working on the problem of an automatic torque converter, this statement may be very confusing since the fact that this cannot be done has generally and rightly been accepted, and is supported by Newton's law of action and reaction. It would therefore be of some interest to present an analysis showing why a stationary reaction member or its equivalent must be incorporated to get an increase in torque.

We will assume that torque change means increased torque output at decreased speed since that is what we are after in an automatic transmission.

In the conventional gear transmission the gear ratios are primarily

determined with a smooth and fast acceleration in mind and the torque increase naturally is in direct proportion to the ratio of the gearing. This holds true in any transmission incorporating gears or mechanical means of changing the speed.

In the closed-circuit fluid-coupling or the Foettinger Coupling with two members — Impeller and Runner, torque input equals torque output at all speeds, and a change in speed is paid for by a sacrifice in horsepower as in any slipping clutch. By introducing a third and stationary member a torque increase can be obtained, but only at the cost of a drop in efficiency.

In the open circuit fluid gear a torque increase can be accomplished if the kinetic energy of the fluid be dissipated after leaving the runner and before entering the impeller again. This would require that the fluid be led to a stationary tank which would absorb its kinetic en-

ergy, and this then would constitute the equivalent of a stationary reaction member.

Other types of torque-increasing hydraulic transmissions using liquid in a closed pressure circuit, naturally must have stationary members, and if it was possible to eliminate this, Newton's law of action and reaction would not hold true. Torque change is accomplished by leverage, whether it be mechanical, hydraulic, electric, or pneumatic, and leverage is action and reaction about a fulcrum or its equivalent.

It is necessary to distinguish between speed changes accomplished by slipping which does not affect torque but is paid for in lost hp., and speed changes accomplished by leverage—action which increases torque in direct proportion to the drop in speed if 100 per cent efficient. A compromise between the two would possibly solve the problem satisfactorily for vehicles of light weight where a surplus of power is available at lower speeds.

K. MILLER.

## Special Slide Rules

Special Slide Rules, by J. N. Arnold, Instructor in Engineering Drawing, Purdue University. Published by Purdue University, Lafayette, Ind.

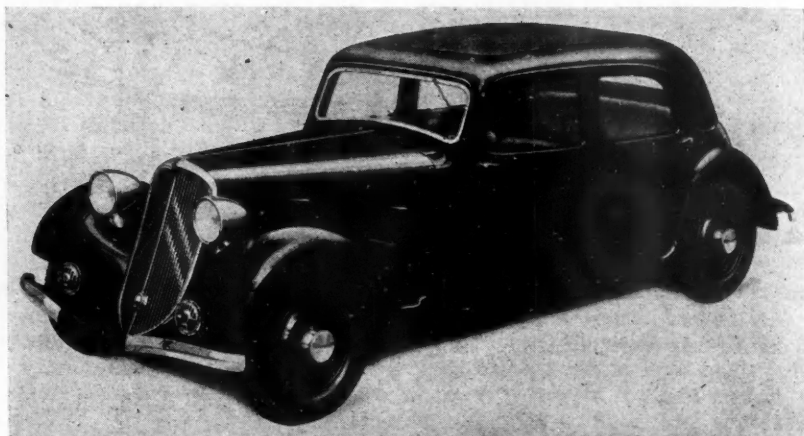
The special slide rule is a device for performing routine computations quickly and with a minimum of effort. It is based on substantially the same principles as the intersection chart and the alignment chart, which are used for the same purpose. As compared with making computations in the ordinary way, with these methods there is less likelihood of errors, and occasionally greater accuracy can be obtained by one of them than by the ordinary method.

In Part 1 of the book under review descriptions are given of a number of special slide rules, examples being a slide rule for air-density correction factor and a slide rule for the solution of a column formula. Part 2 covers the theory of special slide rules and Part 3, their construction. An appendix contains Logarithmic Relations, a Bibliography, and a list of Commercial Special Slide Rules.

# Citroen's New Front Drive Model Is Replete With Unconventional Features

A COMPLETE departure from conventional design is represented by a small car recently launched on the French market by the Citroen Company, of which we find brief descriptions in several European publications. The drawings reproduced herewith are from *The Autocar*.

First of all, the car has a front drive. Engine, clutch, transmission and final-drive gear are arranged in a single block, with the final drive between the clutch and transmission, so that the latter is located forward of the front wheel center line. All four wheels are torsion-bar suspended. The car has no frame of the conventional type, but instead it has a pressed-steel backbone or platform, which at the front end has bolted to it a pressed-steel cradle for the powerplant, and at the rear a number of brackets in which the transverse torsion bars of the rear-wheel suspension have their bearings. These torsion bars are anchored at the center of the chassis and at their outer ends carry radius rods extending to the rear axle. Thus the platform extends back only about as far as the forward end of the rear springs in a conventional chassis. Springing of both the front and rear wheels is by the torsion-bar system.



Citroen front-drive 80-cu. in. small car selling at the equivalent of \$1,175 in France

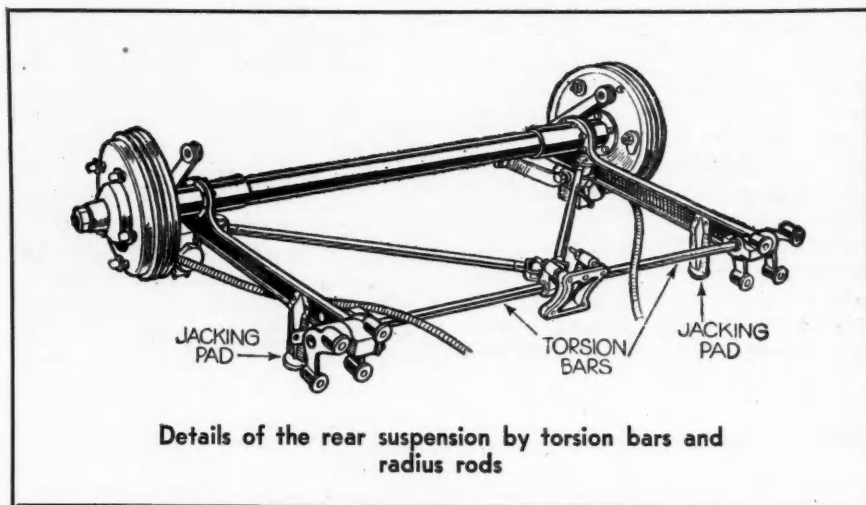
An all-steel body is used (Citroen being allied with the Edward G. Budd Mfg. Co.), and the body is well streamlined but is not radical in appearance. The radiator front is quite similar in appearance to that of many American 1934 models.

None of the accounts which have come to our attention give the bore and stroke of the four-cylinder engine, but it is said to have a displacement of about 80 cu. in. and to develop 38 hp. The design is quite different from that of previous Citroen engines, there being removable

cylinder liners of the wet type, three main bearings on the crankshaft, and valves in the cylinder head, operated through pushrods. Citroen controls the European patents on Chrysler "floating power," and he uses this system of engine mounting on the new car. The radiator is mounted on the powerplant. The transmission, which projects forward of the front wheel center line, is of the three-speed type but without direct drive, the bevel pinion of the final drive being mounted on a rearward extension of the secondary shaft.

From a U-shaped engine cradle in line with the front wheels and secured to the pressed-steel platform by long studs, there extend two links to the steering head on each side. The inner ends of the lower links are secured to the forward ends of torsion bars extending lengthwise of the body, which form the suspension members. Frictional shock absorbers are mounted at the ends of these torsion bars. Drive to the front wheels is through exposed propeller shafts with universal joints at both ends.

At the rear the suspension is by torsion bars extending crosswise of the car. At their outer ends these torsion bars carry radius rods extending to the straight rear axle. Hydraulic shock absorbers are fitted at the rear. Hydraulically operated



Details of the rear suspension by torsion bars and radius rods



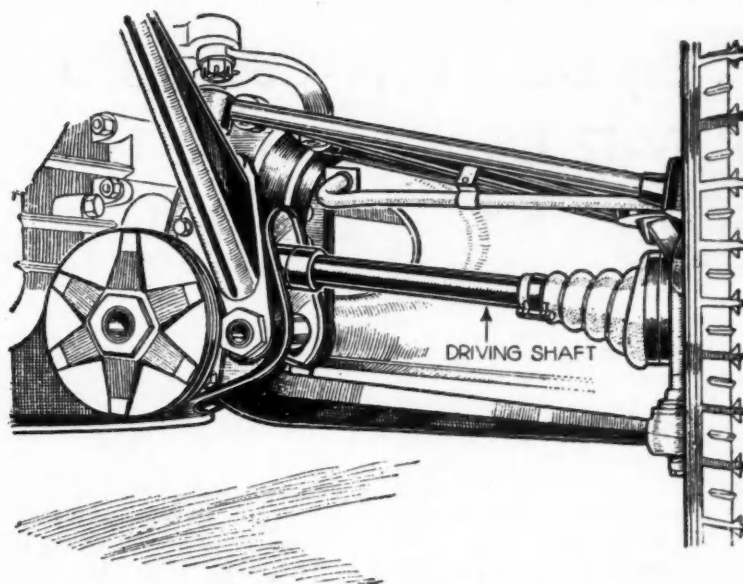
brakes of the duo-servo type are fitted, the rear brakes being set separately by means of the hand lever.

The four-passenger car complete weighs 1980 lb. and sells in France for 17,700 francs (\$1175 at the current rate of exchange). Its maximum speed is said to be 62 m.p.h. and the fuel mileage 26 per U. S. gal.

The center portion of the pressed-steel backbone or platform forms the floor of the body. Owing to the absence of a longitudinal propeller shaft, this could be placed quite low. No running boards are provided, and one steps directly into the car. The body shell is welded to the platform, so that if the platform is regarded as a frame, body and frame are a rigid unit.

Gear-shifting is effected by means of a lever projecting through the dashboard and the emergency brake is applied by a pull rod on the dashboard, hence the front compartment is entirely unobstructed.

It is stated that the torsion-bar independent suspension system will be applied also to the other larger Citroen models.



Suspension at the front is by longitudinal torsion bars provided with lever arms extending to the steering heads and carrying friction-disk shock absorbers at their front ends

## High-Spots in Building Cadillac and LaSalle Transmissions

Fig. 1

LaSalle and Cadillac are among the select few who use the modern gear grinder for finishing the form and dimensions of transmission gear teeth

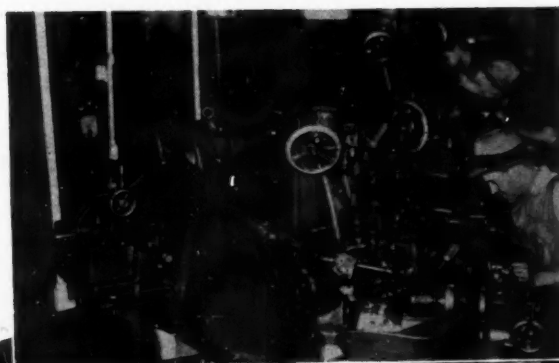


Fig. 3

Every transmission coming off the assembly line is stethoscoped to assure quietness within prescribed limits



Fig. 2

Final operation on transmission gears for LaSalle and Cadillac is precision lapping with the new Inco lap process

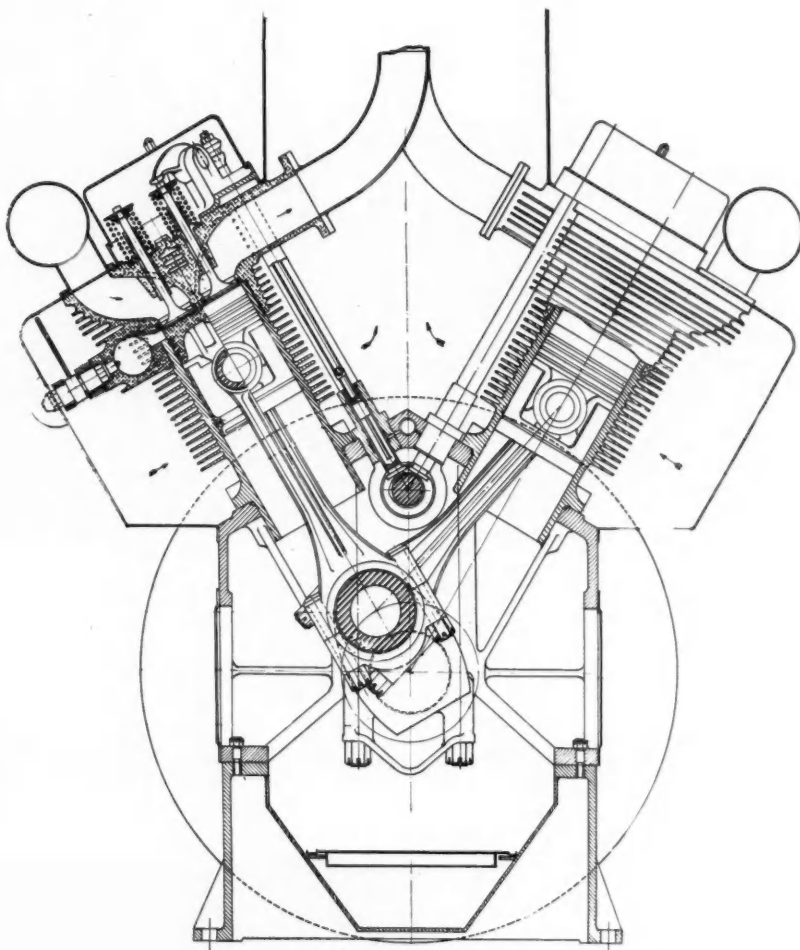


## R. P. Lay Designs Air-Cooled 180 H. P., V-12 Diesel for Railcar Use

A 12-cylinder air-cooled Diesel engine has been designed by Robert P. Lay of Oil City, Pa. Mr. Lay was for 15 years assistant chief engineer of the H. H. Franklin Manufacturing Co., and therefore is thoroughly familiar with the problems of air cooling, which are less difficult in the case of the Diesel than in that of the gasoline engine, because not only is less fuel burned in the former per horsepower-hour, but a smaller proportion of the heat of the fuel has to be dissipated by the cooling system.

The engine has twelve  $4\frac{1}{2}$  x 6-in. cylinders, giving it a displacement of 1018 cu. in., and it is designed to develop 90 hp. at 1250 r.p.m. and 180 hp. at 2500 r.p.m. It will be seen that provisions are made for supercharging the engine, and a normal b.m.e.p. of 85 lb. per sq. in. is figured on, with a maximum b.m.e.p. of 100 lb.

It is planned to fit the engine with a direct-connected generator for electric drive. The cooling air is to be taken in through the roof, which will be fitted with a fan with electric motor attached. From the housing of the fan the air is led down and enters the jackets of the two banks of cylinders at the rear, over the generator; the air flows over the fins of the cylinders into the space between cylinder banks and then up and out through the roof. The exhaust is discharged through the cooling-air outlet pipe, and the ejector effect thus produced undoubtedly adds to the circulation of air over the cylinders. Mr. Lay believes that the absence of a radiator permits of



Lay 12-cylinder air-cooled Diesel engine for railcars

better streamlining of the car. Another advantage of the air-cooling system is that it eliminated a good portion of the "plumbing" system. The principal advantages of the Diesel for railcar use are, of course, great fuel economy and reduced fire hazards.

either have supercharged passenger cars in production, have them running experimentally, or have had drawings of supercharging equipment prepared, making a total of twenty firms. Of these, four are using superchargers of the Roots blower type, all on cars listing at over \$5,000. Of the remaining sixteen firms one is using a centrifugal compressor, while all of the rest are either using or considering the use of the Zoller, which may be described as of the sliding vane or eccentric type. One explanation of the relative popularity of the supercharged in England is, of course, that the high registration tax induces people to buy cars of small displacement, and the supercharger is then resorted to to increase the power.

## Pomeroy, Jr., Sees Growing Interest in Superchargers

LAURENCE POMEROY, JR., who is connected with M. A. McEvoy, Ltd., British manufacturers of the Zoller supercharger, and who throughout the past year has issued

monthly "Notes on High-Density Induction," in a recent communication states that so far as he knows, ten English, six German, two Italian, one French and one American firm